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# THE CONDOR

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# THE CONDOR

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# THE CONDOR

JOURNAL OF THE COOPER ORNITHOLOGICAL SOCIETY

VOLUME 61



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1959



TURQUOISE-BROWED MOTMOTS

*EUMOMOTA SUPERCILIOSA*

One-third natural size

From an oil painting by Don R. Eckelberry



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# THE CONDOR

VOLUME 61

JANUARY-FEBRUARY, 1959

NUMBER 1

## THE TURQUOISE-BROWED MOTMOT

By DON R. ECKELBERRY

To come out of the dark interior of a Mayan building and to see twelve Turquoise-browed Motmots (*Eumomota superciliosa*) perched in one small tree is a memorable ornithological experience. It was thus that I was first introduced to this handsome species at Chichén Itzá in Yucatán. The motmots share the unusual nesting opportunities afforded by these Mayan ruins with Cave and Rough-winged swallows (*Petrochelidon fulva* and *Stelgidopteryx ruficollis*), and like them, here at least, can be said to be colonial. Over the surrounding flat, arid plain covered with deciduous forest, where the land is not cultivated, these motmots are less concentrated but are by no means uncommon.

Like the Russet-crowned Motmot (*Momotus mexicanus*) of México and the arid interior of Guatemala, the Turquoise-browed Motmot is a confiding species of dry regions. According to Paynter (Peabody Mus. Nat. Hist. Bull., 9, 1955:158), it makes contact with the Blue-crowned Motmot (*Momotus momota*) where the low scrub forest intergrades with higher, wetter forest. Skutch (Animal Kingdom, 61, no. 1, 1958:8), writes that it mixes more freely, as might be expected from the greater similarity in respective habitats, with the Russet-crowned Motmot in the Motagua Valley of Guatemala.

Of the eight species comprising this distinctive and attractive Neotropical family, the Turquoise-browed Motmot is the most beautiful in color (see frontispiece) and its racquet-shaped tail the most highly developed. The denuded portions of the middle rectrices begin about midway or at the end of the next longest pair. The terminal paddles are larger than those of other species as the webs are longer at the tip than toward the base of the same feathers. In the field these feathers look slightly recurved. The turquoise supercilaries are so lustrous that in sunlight they seem almost white, and so elongated that they obscure the forehead and most of the crown when not compressed.

Highly colored and unretiring as they are, these motmots are often surprisingly hard to locate. In the nesting season at least, they are as much in evidence by sound as by sight. From the thorny brush their distinctive voice is heard—a slightly upslurred *quark*, fairly loud though low in pitch and husky in quality, a rather fluty sound as of two notes given together. When excited they have a longer call.

Like other motmots this species sits motionless for long periods except for an occasional jerky tick-tocking of its tail or a rapid shift to face the other way, effected by whipping its tail up and over the branch with an easy flourish. When finally it darts away, it flies low and swiftly for no great distance in long shallow undulations.

Ordinarily these motmots dig burrows about five to eight feet long in a bank where the identically marked female deposits four roundish white eggs in late April or early May. The pair shares incubation for about three weeks. The young, born naked and blind, leave the nest in about a month—a nest by that time verminous, fouled with droppings and littered with the regurgitated remains of past meals. Upon their emergence, writes Skutch (*op. cit.*, 1958:11), the plumage of the young birds "is as fresh and neat as if they had grown up in a nursery that had been kept scrupulously clean. One marvels that such loveliness should have come into being in a putrid hole in the ground."

*Babylon, Long Island, New York, July 1, 1958.*

## LOCOMOTION AND OTHER BEHAVIOR OF THE DIPPER

By WILLIAM R. GOODGE

As a part of a study of adaptations for aquatic life in the North American Dipper (*Cinclus mexicanus*), an effort was made to learn more about the locomotor behavior of this species in order to form a basis for interpretation of structural modifications. In this paper the locomotion of the dipper, with particular regard to underwater progression, is described and analyzed by the use of information obtained through field study and by observation and motion picture photography of captive birds in the laboratory. Although a thorough field study of nesting behavior was not a part of this work, some data of this nature obtained during the study of locomotor behavior will be included. The latter material, although fragmentary, supplements previously published information. Until the work of Hann (1950) there had been no intensive study of the nesting habits of this species in spite of the fact that its unusual mode of life for a passerine bird makes it an especially interesting species.

## MATERIALS AND METHODS

Dippers were observed in the field at many localities in the state of Washington, but the majority of the observations were made on a pair of birds nesting along the upper Raging River in the western foothills of the Cascade Mountains near North Bend, Washington, at an elevation of about 1000 feet. Other nesting dippers were observed along Icicle River near Leavenworth on the east slope of the Cascades at an elevation of about 2500 feet. Most of the field work was done in 1954 and 1955.

To supplement field studies, seven specimens were captured alive by means of a Japanese "mist" net placed across a stream just above the surface of the water. The dippers were kept in the laboratory in cages for varying periods of time and used in several phases of the work. Soon after their capture, three of the birds were placed in glass-fronted tanks of still water used in the University of Washington College of Fisheries for rearing fish. The tanks, which are 60 inches long, 24 inches wide, and 28 inches high, were covered with netting to prevent escape and were filled one-half full of water. A floating board provided a resting place for the bird. Either the birds were caused to dive by movements of the hand or, in one case, the bird actively pursued small trout placed in the tank. The activities of the dippers were observed and motion pictures were taken. A 16-mm. Cine-Kodak special number 2 motion picture camera was used with Kodak Super-X fine grain reversal film. Two number 2 photoflood lamps provided overhead lighting. Outside light was not excluded, but with the room lights turned off, reflection from the glass was prevented.

In order to study the locomotion of the dipper in moving water one specimen was placed in a flume in the Hydraulics Laboratory. The flume measured ten feet in length, one foot in width, and one and one-half feet in height. The bottom of the flume was covered with small stones and a waterfall was formed at the end of the flume where the water entered. Because the exit pipe was not sufficiently large to carry away the water fast enough to maintain a constant velocity and water level, a series of observations were made by alternately allowing the flume to fill up and empty. When the flume was being filled, the velocity of the water varied from about 0.75 to 1.5 feet per second. A board and several large stones provided resting places for the bird. It was observed and photographed with the same equipment used for the still water tanks. Motion pictures were made at speeds of 32 and 45 frames per second.

The films were projected by use of a Keystone projector with a speed control box capable of slowing the projector to any required speed or of stopping it for the still

projection of individual consecutive frames. By means of a mirror placed at an angle of 45 degrees to the light beam the image was projected on paper. By this means enlarged tracings were made for consecutive frames in order to analyze complete locomotor cycles for both limbs.

#### ACKNOWLEDGMENTS

The writer wishes to thank the members of the Zoology Department of the University of Washington, particularly Dr. Richard C. Snyder and Dr. Frank Richardson for their help and advice in the course of this work. Thanks are also due to the School of Fisheries and the Hydraulics Laboratory for the use of their facilities and to Mrs. Hall Schumacher for the care of living birds.

#### FIELD OBSERVATIONS

Although dippers have been studied by many people, field observation of underwater locomotion has its limitations because much of the time the birds feed in turbulent water and because their movements are rapid. Only occasionally does the observer have an opportunity to see them swimming in clear, shallow water.

Grinnell and Storer (1924) state that dippers move by short hops on land, but from my own observations I agree with Hann (1950) that they ordinarily run or walk, but that they may resort to hopping on rough or steep ground.

Dippers often feed along the shore or cling to rocks while wading in the water. Frequently they stand on a submerged rock facing the current and hold the head under water, apparently obtaining food that is carried downstream by the current. On land they may stand on one leg, with the other held close to the body in the manner of wading birds.

Although there is some movement to lower elevations in winter, dippers are non-migratory. Their flight is limited to going up and down the course of a stream, usually just above the surface of the water. The flight of the dipper is steady with rapid wing beats. The birds readily avoid obstacles along the stream such as overhanging logs or bushes. In one instance, a dipper was seen to pursue and catch flying insects by hovering over the water. On the surface of the water, they may alternately move the hind limbs in a paddling motion, but since the toes are not webbed they cannot move rapidly in this manner. To obtain more speed or to avoid being carried downstream by the current they sometimes flap their wings on the surface of the water. This method of locomotion may also be used just before flight from the surface of the water.

Dippers dive directly into the water from the air or more frequently from the surface of the water. They were never observed to wade above their own depth and they often dived under the surface by using the wings in shallow or slow-moving water. Sometimes they return to the surface after a dive and fly into the air without pausing on the surface. According to some of the sources quoted by Bent (1948) and judging from my own observations, dippers probably do not remain under for more than about ten seconds, although Cordier (1927) wrote that they may remain under for 30 seconds and Muir (1894) implies that a dive may last as long as two or three minutes.

#### OBSERVATIONS ON CAPTIVE BIRDS

For the most part the dippers were kept in a cage in the laboratory. They soon became adapted to confinement and took food. They were fed meal worms, earthworms, ant eggs, salmon eggs, and pieces of fish, but of these they seemed to prefer meal worms and ant eggs. The meal worms and earthworms were grasped in the bill and beaten on the cage floor before they were swallowed. When sleeping, the dippers either stood on the cage floor or perched on a horizontal rod near the top of the cage. Sometimes the

birds stood or perched on one foot. The dipping which is characteristic of the species was not frequently observed in the captive birds.

When a recently captured adult dipper was placed in a tank of still water, it stood on the floating board placed in the tank or swam on the surface of the water. The birds appeared to be quite buoyant. The relative depth of the swimming bird is indicated in figure 1 by the horizontal line which represents the water level. The dipper was caused to dive by movements of the hand from above the tank. In these instances, it did not

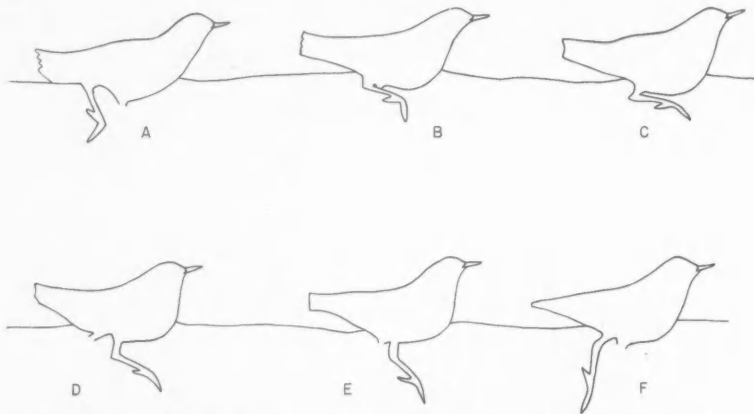


Fig. 1. Tracings from consecutive motion picture frames illustrating the hind limb cycle of *Cinclus* when swimming on the surface of the water.

dive deeply nor stay under the water long. Observations of probably more normal behavior were obtained by placing small trout in the tank. The fish were readily captured by the dipper, which in at least one case sighted the fish from the surface and dived almost vertically downward to capture it.

Vertical and horizontal progression under water was accomplished primarily by use of partly opened wings (fig. 4). The dive from the surface of the water begins with the head held under the water, the legs extended, and the posterior part of the body elevated. The wings are elevated, and one or two strokes of the wings propel the bird under the surface. The actions were somewhat obscured by splashing water, but in most instances at least the hind limbs did not appear to assist the wings. Instead, once the dive began they were flexed close to the body. Subsequent observation of the action of a bird in shallow water showed that in one instance, at least, the legs as well as the wings were employed. At the beginning of the dive, the legs were used in a paddling motion along with the first strokes of the wings and then they were brought to the flexed position and the use of the wings continued. When the dipper reached the bottom, the legs were extended in some instances and were used to assist forward progress. A sequence photographed when the bird was pursuing a fish showed this type of action particularly well. The legs were extended and used alternately in a running motion which helped to propel the bird along the bottom. When it momentarily left the bottom, the legs were either flexed or trailed behind. When it again reached the bottom, the running action was repeated. It was necessary for the bird to make continuous use of its wings in order to remain at the bottom of the tank. The tanks used in this series of observations had

smooth surfaces so that there was no opportunity to test the hypothesis that dippers are able to walk along the bottom without the aid of the wings. When the bird returned to the surface, the legs were sometimes employed in a paddling motion much as they are on the surface. A more detailed description of leg and wing action follows.

A captive dipper was placed in a tank of still water about five feet long with a ramp which extended to the bottom of the tank. The ramp and bottom of the tank were covered with sand and small stones. Meal worms were put in the tank. The dipper dived for the meal worms, which were lying both on the bottom among the stones and on the ramp, but it did not walk along the bottom or on the ramp under water.

Examination of a recently captured adult bird after a series of dives in the tank showed that it remained relatively dry. Sometimes the bird shook the excess water from its plumage and vibrated its wings. It did not preen its feathers frequently during the period of observation. A fully fledged juvenal dipper placed in the tank became very wet especially on the ventral surface and it appeared to float lower in the water than an adult. The young bird was induced to dive, but it did not make much progress. Observations in the field indicate that recently fledged young usually feed along shore and do not ordinarily dive under the surface. It is probable that the water-repellent qualities of the plumage are not fully acquired until some time after fledging and possibly not until after the postjuvenal molt. Dippers in captivity apparently soon lose the water-repellent qualities of the plumage. A bird placed in a tank eight days after its capture became very wet. Crandall (1952) reports that a specimen of *Cinclus leucotus* at the New York Zoological Park became water-soaked unless it entered the water regularly.

Behavior of the dipper in the flume was similar to that in still water. In a strong current, the bird was able to maintain its position by vigorous paddling with its feet, but it did not make any forward progress. Sometimes the wings were used in a flapping motion on the surface of the water. At the base of the waterfall there was an eddy. Frequently the dipper floated on the surface there and was thus able to maintain its position with less effort than in the current. The movements of diving and swimming under water appeared to be identical to those employed in still water. The dipper dived to the bottom to pick up salmon eggs lying among the rocks. It clung for an instant to the rocks, but wing action appeared to be necessary for it to remain on the bottom. In spite of the variation in current velocity and depth of the water, the dipper was never observed to walk along the bottom. Several times the water level was lowered so that the bird could perch on a small stone, and then the water level was gradually raised again. In these instances, the bird maintained its position until the water was about halfway up on the body and then it floated off or flew.

#### ANALYSIS OF LOCOMOTOR CYCLES

Impressions of locomotor behavior were confirmed by motion pictures. An analysis of the limb action was made by means of tracings of consecutive frames projected on paper. For the hind limb, the position of the skeletal elements could be determined approximately; for the wing, this was not possible since the joints are obscured by the plumage and the shoulder joint is not fixed.

*Hind limb.*—Figure 1 illustrates the leg action of the dipper swimming on the surface of the water. The legs are employed alternately, but for clarity only one leg is illustrated in the figure. The swimming motion consists primarily of a flexion of the tarsometatarsus during the recovery phase (A-B) and an extension of that element during the propulsive phase (C-F). It may be noted that the leg is not extended far posteriorly at the completion of the propulsive stroke. During the recovery phase, the

toes are flexed; during the propulsive phase, they are extended. Examination of the leg action photographed when the bird was facing the camera clearly showed that the toes are abducted during the propulsive phase and adducted during the recovery phase. The hallux is always extended when the bird is swimming with the feet.

The relative positions of the skeletal elements during a swimming movement of the leg are shown in figure 2; A-C represent the recovery phase and D-F the propulsive phase. The position of the acetabulum was determined by measuring its distance from the tip of the tail on a fresh specimen and reducing this distance to the scale of the tracing. The lengths of the femur and tibiotarsus were also reduced to scale relative to the

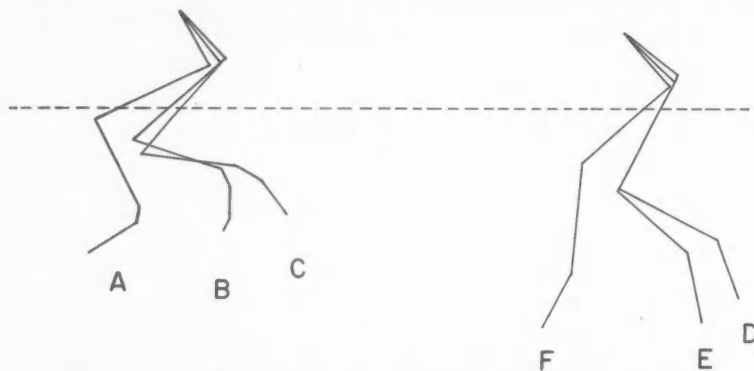


Fig. 2. Position of the hind limb elements of *Cinclus* when swimming on the surface of the water during the recovery phase (A-C) and the propulsive phase (D-F).

length of the fully exposed tarsometatarsus, and the intersection of arcs with radii of these lengths and with centers at the acetabulum and the tarsometatarsal-phalangeal joints respectively determined the position of the knee joint.

At the beginning of the recovery phase, the toes are flexed. There is also a flexion of the tarsometatarsus and tibiotarsus, which brings the foot closer to the body. Continued flexion of the tarsometatarsus and flexion of the femur follow, elevating the foot and moving it forward. Finally, some extension of the tibiotarsus and an extension of the toes occur, completing the recovery phase. During the first part of the propulsive phase, the limb is moved ventrally by an extension of the tibiotarsus and tarsometatarsus. This is followed by extension of the femur and flexion of the tibiotarsus accompanied by further extension of the tarsometatarsus carrying the limb posteriorly. During the propulsive phase, there is some flexion at the tarsometatarsal-phalangeal joint, but the toes are extended. When the bird is swimming in a straight line, the movements are anterior-posterior ones in a single plane with no apparent lateralward movement or rotation in any part of the cycle.

During the cycle, the position of the femur is changed the least. From maximum extension to maximum flexion, it moves through an arc of approximately 23 degrees about the acetabulum. At maximum flexion, the tibiotarsus forms an angle of 87 degrees with respect to the femur and at maximum extension, 108 degrees. Thus there is a change of 21 degrees with respect to the femur. The greater length of the tibiotarsus produces a greater change in the position of its distal end than that of the femur even though the degree of movement at the joint is about the same. At maximum flexion, the tarsometatarsus

tarsus forms an angle of 56 degrees with respect to the tibiotarsus and at maximum extension, 137 degrees. Thus there is a change of 79 degrees with respect to the tibiotarsus, about four times as much change as for the femur or tibiotarsus. During the recovery phase, there is some flexion of the anterior toes, and the proximal phalanges form an angle of about 90 degrees with respect to the tarsometatarsus. During the propulsive phase, the phalanges are fully extended, but the toes form an angle of 160 degrees with respect to the tarsometatarsus.

For comparison, figure 3 illustrates the movements of the hind limb elements when the dipper is walking on land. Dippers sometimes move rapidly on land apparently

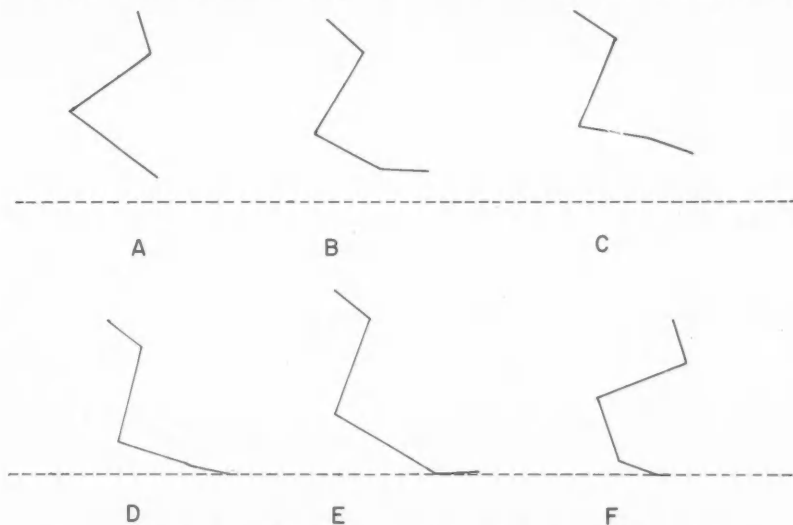


Fig. 3. Position of the hind limb elements of *Cinclus* when walking on land during the recovery phase (A-C) and the propulsive phase (D-F).

running, but actual running, that is with both feet off the ground during a portion of the locomotor cycle, was not observed in any of the motion picture sequences. Although some variation was noted, typically the body remained horizontal and close to the ground because of the shortness of the limbs as well as their position. In the recovery phase of the cycle, the foot is first raised above the substrate by a flexion of the tarsometatarsus. The toes are extended. During this part of the cycle, the body is elevated by the extension of the opposite tibiotarsus and tarsometatarsus permitting some extension of the tibiotarsus. Thus, the limb begins its forward movement. Flexion of the femur follows. Finally, there is an extension of the femur, tibiotarsus, and tarsometatarsus as the limb completes its forward movement and the foot makes contact with the substrate. The toes are slightly flexed before they strike the ground. At the beginning of the propulsive phase, there is a flexion of the tibiotarsus and tarsometatarsus. The toes become hyperextended. Next, an extension of the femur, tibiotarsus, and tarsometatarsus elevates the body. Finally, there is additional extension of the femur and a flexion of the tibiotarsus as the limb completes its posteriorward swing.

The movements of the hind limb elements during walking may be compared to those

during swimming. Although in both cases the relative positions are indicated by angles of an exact number of degrees for comparison, it is recognized that the movements are not likely to be exactly the same in all instances because of differences in velocity, terrain, and other factors, and because the accuracy of the diagrams is somewhat limited

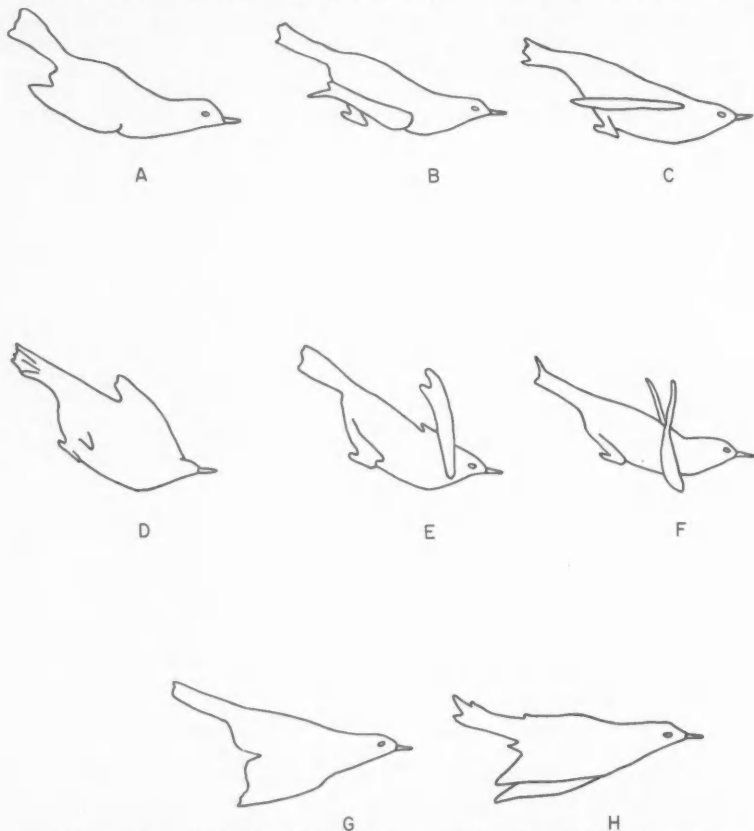


Fig. 4. Tracings from consecutive motion picture frames illustrating the wing cycle of *Cinclus* when swimming under water during the recovery phase (A-D) and the propulsive phase (E-H).

by the fact that the positions of the acetabulum and knee joint were determined indirectly. However, there are consistent differences for swimming and walking, and with due caution the limb action of the dipper could be profitably compared with that of other species. There is considerably more femoral movement in walking than in swimming. From maximum extension to maximum flexion, the femur moves through an arc of 40 to 46 degrees about the acetabulum (23 degrees during swimming). At maximum flexion, the tibiotarsus forms an angle of 76 degrees with respect to the femur and at maximum extension, 116 degrees. Thus there is a change of 40 degrees (21 degrees during swimming). At maximum flexion, the tarsometatarsus forms an angle of 75 degrees



with respect to the tibiotarsus and at maximum extension, 130 degrees. Thus there is a change of only 55 degrees (79 degrees during swimming).

*Wing.*—The wing action of a dipper swimming under water is illustrated in figure 4. It may be noted that the wings are never fully extended throughout the cycle. The recovery phase (A-D) consists mainly of an elevation and drawing the wings anteriorly, apparently by elevation and extension of the humerus. The extreme forward position of the wings is noteworthy. During the first part of the propulsive phase (E-F), there

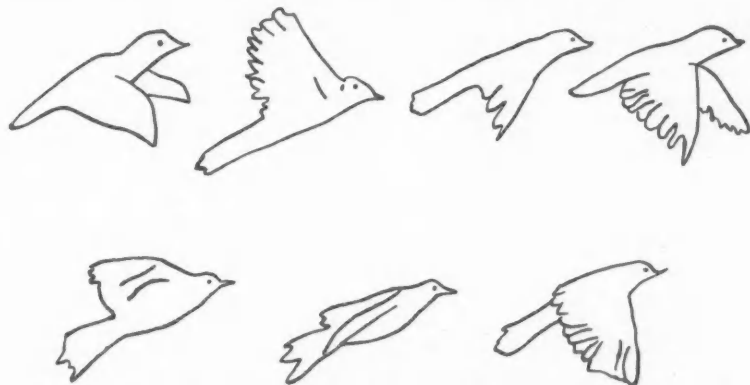


Fig. 5. Tracings from motion pictures of the wing action of the canary (from Demoll, 1930).

is a greater depression of the leading edge as the whole wing is depressed and moved posteriorly. By this means, the angle of inclination is increased. At the end of the propulsive phase (G-H), the wing is returned to a horizontal position with respect to the long axis of the body. It is by means of this tilting of the wing as it is depressed and moved posteriorly that forward motion of the bird is produced. Except when the bird is near the surface or on the bottom, the tarsometatarsus and toes are held in a flexed position close to the body.

Because the action was obscured by splashing, it was difficult to determine the exact nature of the movements of the wings used to aid the bird when swimming on the surface. It could be seen, however, that the wings are fully extended and they appear to be employed in an up and down movement.

For comparison, figure 5 shows the wing movements of the canary in air taken from a paper by Demoll (1930). Although a complete analysis of the flight of the dipper was not made because of the limitations in camera speed, it appears to be similar to that of the canary. The wings are fully extended at the end of both the recovery and propulsive phases. At maximum elevation, the wings are not drawn far anteriorly, as they are under water. In the propulsive phase, the wings are moved anteriorly, not posteriorly, as the wing is depressed. There is little noticeable tilting of the wing.

In the take-off from the ground, the dipper assumes a low crouching position as the wings are raised. Both feet are used simultaneously to assist in the take-off. In the take-off from the surface of the water, two or three wing beats directed downward and forward strike the water. Before the anterior parts of the bird leave the water, a kick, with both feet employed simultaneously, assists the take-off.

*Discussion.*—Much has been written about both the American and European species

of dipper, but there has been no general agreement as to the exact method of under-water locomotion. Especially controversial is the claim by many authors that dippers are able to walk along the bottom under water without the aid of their wings. There are many references to their walking under water, but it is difficult to evaluate many of these accounts because much of the information is probably not based upon personal observations of the author.

It is certain that at least some of the time dippers use their wings when progressing under water, although Michael (1938) doubted that this was so. Crisp (1865), who wrote on the anatomy and habits of *Cinclus cinclus*, believed that the wings were ordinarily employed under water. He quoted Montagu, who described the under water movement as "by short jerks from the shoulder joint not with the extended wings as in other diving birds." He also quoted Macgillivray, who also thought that dippers use their wings under water, but believed that they swim with their wings extended, as in air, concluding that considerable force was necessary to keep the bird on the bottom.

Cordier (1927), writing about *Cinclus mexicanus*, reported seeing a dipper wade along the bottom of a pool, but Grinnell and Storer (1924) concluded that "the dipper dives directly into the stream, usually against the current, and then seemingly walks along the bottom, the wings assisting." This is the view accepted by Hann (1950) and others. Ingram, Salmon, and Tucker (1938) reported watching *Cinclus cinclus* "walk up the center of a rapid mountain stream without the use of its wings." They also state that breeding birds went into a pool near the nest many times and were seen to "walk on the bottom in clear water." One of the authors also observed the use of the wings under water. Dewar (1938) agreed that they do walk along the bottom and suggested a mechanism for this. He stated that the bird always faces the current with the body at an angle sufficient to use the force of the current to hold it under water and pointed out that if they are able to remain under in slight currents or in still water, the birds must have a high specific gravity. Ingram (1938) attacked Dewar's proposal, correctly pointing out (1) that there is no evidence that dippers do have a high specific gravity and (2) that in order to accept Dewar's ideas it must be assumed that the bird is in continuous motion and keeps its head down in still water. He also suggested (3) that the reason the birds swim against the current is to avoid disarray of the plumage.

Holmes (1939) observed *Cinclus cinclus* feeding in an artificial pond with no perceptible current. He saw it wade into the water to its depth, float on the surface, and dive under for never more than five seconds. The bird was not seen to walk along the bottom. Brownlow (1949), on the basis of his own observations, concluded that on the bottom the dipper uses its wings only when it cannot get a good foothold if it loses its grip, and to search for food if the bottom is unsuitable for footholds. Jones and King (1952) observed and photographed *Cinclus cinclus* swimming under water in a glass-fronted salmon tank. An up and down movement of the wings was observed and the bird was not seen to walk along the bottom.

From the evidence at hand, it may be concluded that the role of the hind limbs is secondary to that of the wings under water. As mentioned previously, the legs are sometimes used to propel the bird along the bottom, but the wings must also be used for the dipper to remain under the surface. The legs may also be employed alternately in a paddling motion on the return to the surface. The lack of webbed feet limits the effectiveness of the hind limb in water, but the resistance offered by the toes is sufficient for the dipper to swim in still water or at least maintain its position in a current. To say that it is less well adapted for this environment, however, is not correct since the presence of webbed feet would decrease its ability to cling to the rocky substrate. Unlike more

highly specialized aquatic birds, the hind limb of the dipper is not carried far posteriorly at the completion of the propulsive stroke. In the former types, the distal end of the limb, which is the most effective part, exerts a thrust almost directly behind the body and not below it as in the dipper.

The locomotion of the dipper on land is not suggestive of a type well adapted for speed. The sequences that were illustrated showed that the limb swings forward close to the substrate during the recovery phase, and during the propulsive phase there is only a partial extension of the limb and consequent elevation of the body. Another sequence, photographed in the field, showed a somewhat greater extension of the limb and a more elevated body. In forms more highly adapted for speed on land, there is generally a much greater extension of the limb segments which elevates the body more and permits a longer stride. However, locomotion on land among other passerines is highly variable and the exact movements have not been thoroughly analyzed. For this reason, it is difficult to say to what degree the type of terrestrial locomotion of the dipper is to be correlated with its adaptations for aquatic activity. Whether or not dippers are able to remain under water by clinging to the bottom alone, it is apparent from observations of motion pictures that the toes (including the hallux) are used to grip the substrate when the bird is wading in still water or in a current. It is to be expected, therefore, that the dipper would have a foot adapted for clinging even though this species is more terrestrial than arboreal.

Although aerial flight of the dipper was not thoroughly analyzed, it is evident that *Cinclus* used its wings under water in a manner very different from that in air. In air, the wings provide the lift necessary to sustain flight as well as to give the bird forward motion. Under water, the problem is not one of overcoming gravity, but rather to prevent the bird, which is less dense than the water, from returning to the surface. In addition, the water offers a greater resistance to the wing during the recovery phase than does the air. In air, the downward and forward movement of the wings sustains flight and moves the bird forward, although the exact nature of the propelling forces is not completely known. Under water, the downward inclination of the anterior edge of the wings during the propulsive phase tends to move the dipper toward bottom and the posteriorward movement of the wings propels it. In the dipper, the flight feathers are not sufficiently rigid to form an effective surface of resistance under water when the wing is fully extended. In a partly extended wing, the greater part of its surface is supported by bone or the more rigid parts of the outer primaries. In addition not as great a force is necessary as for the fully extended wing since the work arm of the lever is shortened. The bending of the distal ends of the primaries is shown in figure 4F.

Several groups of birds including alcids, some ducks, diving petrels, and penguins use their wings under water, but the movements have been analyzed only for the King Penguin (*Aptenodytes patagonica*) by Neu (1931). The penguin wing is, of course, highly modified for underwater swimming. The loss of flight feathers, the flattened bones, and the rigidity of all but the shoulder joint indicate a much more efficient swimming organ than the wing of the dipper, but in spite of the structural differences, a comparison of the locomotor cycles of the two forms indicates a similarity between the two. The penguin wing cycle is shown in figure 6A; figure 6B is a similar representation of the wing movements of the dipper. Neu described the movement of the penguin wing as follows: "The up and down movement is combined with a depression of the forward edge of the wing during the downstroke—thus driving the water back with the concave surface of the wing." The entire wing forms a nearly rigid surface and is not flexed in the penguin as it is in *Cinclus*. With sufficient muscular strength to move it, the rigid

distal end of the wing can produce a more rapid propulsion of the penguin body than does the wing of the dipper which must of necessity act upon water nearer to the body axis. In the recovery phase, the wings are elevated more in *Cinclus* than in the penguin. In the latter, they are raised little above the body axis. In the penguin, there is a greater anterior-posterior movement than in *Cinclus*.

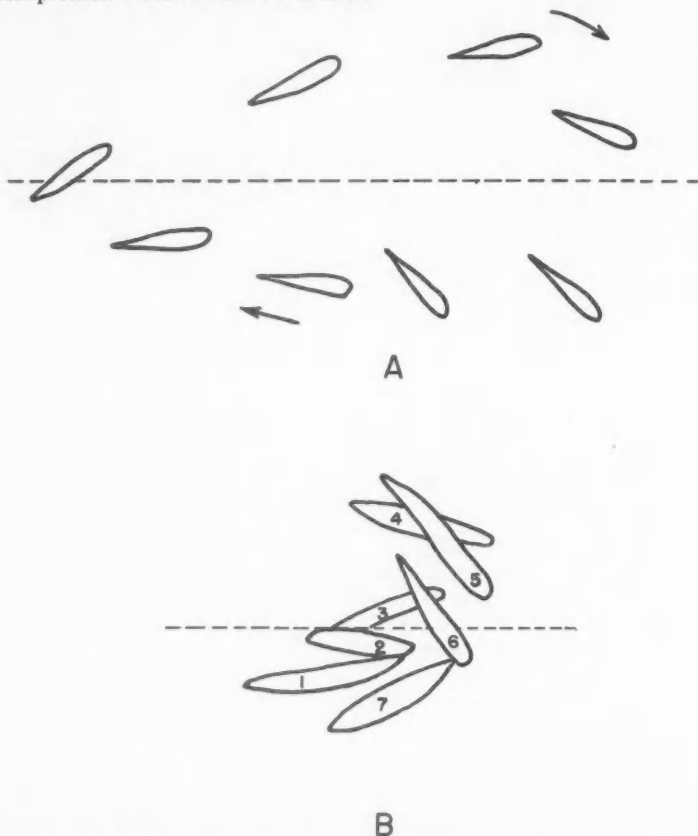


Fig. 6. Lateral view of the wing action of the King Penguin (*Aptenodytes patagonica*), from Neu, 1931, illustrated diagrammatically, (A), and of *Cinclus* (B).

It may be concluded that although *Cinclus* employs both wings and hind limbs during underwater locomotion, the most effective organs of propulsion are the wings. Although they are used in a different manner in water than in air, the wings have lost little if any of their efficiency as organs of flight. The legs are used to assist the bird's progress on the bottom as well as for swimming on the surface, but I can present no evidence that *Cinclus* is able to walk under water without the aid of its wings. It is of course difficult to deny the observations of others, but it may be suggested that with the rapid movements of the only partly extended wings and the difficulty of making

observations of underwater activity in the field, previous observers have incorrectly concluded that the birds seen by them did not open their wings under water. Only motion picture photographs of *Cinclus* walking along the bottom without the use of its wings would conclusively demonstrate this ability.

#### OBSERVATIONS OF NESTING HABITS AND OTHER BEHAVIOR

*Blinking of the white eyelid.*—From observation of captive birds, it may be stated conclusively that it is the movements of the white-feathered lids (mainly the upper) which produce the white flash seen in the field. Although the birds blink at irregular intervals, in one instance in which the rate was timed it occurred at a rate of 40 blinks per minute and in another case, 50 per minute. The blinking was sometimes unilateral and sometimes bilateral. Frequent blinking of the eyelids is unusual among other passerine birds. Instead it is the nictitans that is regularly drawn across the surface of the cornea.

When the region of the lids of a captive dipper was touched, a movement of the nictitans was observed. It was seen to move only about one-half of the distance across the eye, moving in a posterior-ventral direction from the anterior-dorsal corner. It could not be determined, however, whether or not the nictitans is ordinarily moved at the same time as the lids are closed.

*Courtship.*—At the Raging River nest site, the birds were first observed on March 25, 1956. The nest was found on April 8, but its construction was not witnessed. One instance of courtship feeding was observed that day. One bird had what appeared to be an aquatic insect larva in its bill. The other of the pair fluttered its wings and gaped. The latter then pecked at the food several times, finally took the object, and swallowed it. Both birds dipped frequently during this activity. The male dipper sang on a rock about 100 yards from the nest on April 15. No other courtship behavior was observed throughout the nesting period.

*Nesting.*—Two of the nests found were built on rock ledges along a swiftly moving stream above deep water. One nest was resting on a girder of a large highway bridge, and another was built on a beam of a wooden flume. Only the last named nest was wet by spray. Examination of this nest after the young had left revealed that it was lined with ponderosa pine needles.

As might be expected, nesting begins much earlier at the lower elevations (where the present observations were made) than at the sites studied by Hann (1950) at elevations of 9000 to 10,000 feet. The most extensive observations were made of the pair nesting along the upper Raging River (elevation about 1000 feet). The female was not incubating on April 8, 1956, but had begun by April 15. The young hatched between April 26 and 28 so that if the incubation period is considered to be 16 days (Hann, 1950), incubation would have begun between April 10 and 12. The young left between May 21 and 25 or by calculation, using 24 to 25 days for the period the young remain in the nest unless disturbed, between May 21 and 23. Five other records of nests with young at Tumwater Canyon (elevation about 1700 feet) and Icicle River (elevation about 2500 feet) both near Leavenworth, Washington, indicate that the beginning of incubation was between April 5 and May 10. These birds would have left the nest by the third week in June at the latest. By contrast, the dippers studied by Hann in Colorado began incubating June 2 to 21 (all except one from June 2 to 8) and the young did not leave the nest until July 12 to August 1.

The question of second nesting is discussed by Hann. Although the early nesting of dippers at lower elevations would favor the raising of a second brood, no valid records are available. Observations were made at various times throughout the summer in the

areas where dippers had nested, but no adults were observed at the nest sites during July and August at the three localities mentioned above. It is possible, but not likely, that the adults move to higher elevations to nest a second time.

Incubation was carried out by only one of the pair (presumably the female) during the periods of observation. In three instances in which times were recorded, attentive periods at the nest lasted 32, 33, and 34 minutes and periods away from the nest, 7, 8, and 10 minutes. These attentive periods are in contrast to those of one hour and twenty minutes recorded by Hann, who attributed the long periods at the nest to the fact that the female does not have to search far for food. No doubt the availability of food varies locally and there also may be other individual variation not dependent upon this factor. Observations on the feeding and brooding of the young do not vary significantly from those recorded previously. Both parents feed the young. In the instances in which times were recorded, feeding occurred every one to seven minutes (usually every two minutes) two or three days before the young left the nest at the Raging River site. Six days later, the young were observed out of the nest being fed by the parents. In one instance, a young bird was fed a small fish.

Hann reported the removal of nest-lining material by the parent birds soon after the young leave the nest, and this explains why some abandoned nests are found without lining material. The same behavior was observed in one instance during the present study.

Three juveniles were observed feeding along the Raging River on June 9, June 24, and July 7, but no adults were seen during that period. The young dippers fed mainly along the shore or waded in the water. Occasionally they swam on the surface of the water when carried away by the current. Only once, on July 7, did a young bird under observation dive under the surface. A small fish was caught.

*Anting.*—The behavior known as "anting" has been recorded for the European Dipper (*Cinclus cinclus*) by Creutz (1952). I observed in one instance during the present study behavior that may be described as "anting." The dipper was seen to rub the primaries with an object, possibly an aquatic insect larva (unfortunately the distance was too great for positive identification or to describe the procedure in detail). Apparently the object was finally swallowed. Other instances of "anting" should be looked for in dippers.

#### SUMMARY

The terrestrial, aerial, and aquatic locomotion of the North American Dipper (*Cinclus mexicanus*) is described and analyzed by the use of information obtained through field study and by observation and motion pictures of captive birds.

On the surface of the water *Cinclus* swims with its feet in a paddling motion. To obtain more speed or to maintain its position in a current the wings are sometimes used on the surface. Dippers may dive under the water from the air or more frequently, from the surface. Sometimes they return to the surface after a dive and fly into the air without pausing on the surface.

Captive dippers were observed and motion pictures were taken of the birds in tanks of still water. The birds were caused to dive by movements of the hand or they pursued small fish placed in the tank. Vertical and horizontal progression under water is accomplished primarily by the use of partly opened wings. When the birds reached the bottom the legs were sometimes extended and used to assist forward progress, but it was necessary for the birds to use their wings at all times to remain under the water.

A dipper was placed in a flume in order to study the actions of the bird in a current.

The behavior in the flume was similar to that in still water. Although the water level and current velocity varied, the dipper did not walk along the bottom under water.

From tracings of consecutive motion picture frames, analyses of the locomotor cycles of the hind limbs and wings were made. The actions of the legs when *Cinclus* is swimming on the surface and walking on land are compared. Similar comparisons are made between the action of the wings in air and under water and the differences are discussed.

No evidence is presented that *Cinclus* is able to walk along the bottom under water without the aid of the wings.

Additional notes on other behavior and nesting habits of dippers are included. Approximate nesting dates for birds breeding at low elevations in the state of Washington are given. There is no evidence for more than one nesting per season.

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Department of Zoology, University of Washington, Seattle, Washington (present address: Department of Gross and Neurological Anatomy, West Virginia University School of Medicine, Morgantown, West Virginia), July 29, 1958.



## DISTRIBUTION AND MIGRATION OF THE BLACK ROSY FINCH

By NORMAN R. FRENCH

Since 1951, the alpine habitat of the Black Rosy Finch (*Leucosticte tephrocotis atrata*) has been visited in many mountain ranges for the purpose of determining the breeding range of this species. The distribution of this species has long been uncertain. Available information is scattered and some of it remains unpublished in the form of museum specimens. This report adds new findings and summarizes existing data on distribution.

Part of the work was conducted with sponsorship of the Jackson Hole Biological Station. Support from the New York Zoological Society and from the Frank M. Chapman Memorial Fund made much of this effort possible. Jean B. French aided in all phases of the investigation. William H. Behle gave freely of his time and advice and was extremely helpful and cooperative at all times. Specimens collected during this study have been added to the collection of the University of Utah Museum of Vertebrate Zoology (UU). I am indebted also to the following persons who furnished information or specimens from collections which were used in connection with this report: Lang Bailey, formerly with the Colorado Natural History Museum; R. M. de Schauensee, Philadelphia Academy of Natural Sciences; Herbert Friedmann, U. S. National Museum; H. K. Gloyd, Chicago Academy of Sciences; C. M. Greenhalgh, Utah State Fish and Game Department; J. C. Greenway, Museum of Comparative Zoology; L. M. Huey, San Diego Natural History Museum; J. B. Hurley, Yakima, Washington; A. H. Miller, Museum of Vertebrate Zoology (MVZ); R. C. Murphy, American Museum of Natural History; R. T. Orr, California Academy of Sciences; K. C. Parkes, Carnegie Museum; H. G. Rodeck, University of Colorado Museum; C. H. Rogers, Princeton Museum of Zoology; C. G. Sibley, Cornell University Laboratory of Ornithology; L. L. Snyder, Royal Ontario Museum of Zoology; K. E. Stager, Los Angeles County Museum; J. Van Tyne, University of Michigan Museum of Zoology; and P. L. Wright, Montana State University.

*Specific status of the rosy finch.*—The Black Rosy Finch, as suggested by Mewaldt (1950:239), was found to intergrade with the Gray-crowned Rosy Finch (*L. t. tephrocotis*) in the Bitterroot Mountains of the Montana-Idaho border. In 1953, specimens were collected on St. Joseph Peak, St. Mary Peak, and Trapper Peak. These include the northernmost and southernmost high peaks of the range, separated by a distance of nearly 50 miles. Twenty-one specimens were collected in August, of which seven were adults. The major difference between the two supposed species is in the color of the back and the entire ventral surface including the neck, throat, and sides of the head. These regions are sooty black in the Black Rosy Finch and cinnamon brown in the Gray-crowned Rosy Finch. Adult specimens from the Bitterroot Mountains vary from the nearly typical Black Rosy Finch condition to the nearly typical Gray-crowned Rosy Finch condition. This range of variation indicates that the "hybrids" reproduce and that body color is due to multiple factors. This would account for the gradation from one extreme to the other found in the Bitterroot population. A similar situation was found to exist in the Seven Devils Mountains of western Idaho. In July of 1957, 16 specimens were collected near He-Devil Mountain at approximately 8000 feet elevation. These exhibit the same range in body color as do the birds from the Bitterroot Mountains.

Figure 1 represents the range in coloration of the birds from the Seven Devils Mountains and the Bitterroot Mountains based on a score from one to 12. Each specimen was scored on the basis of the colors of three regions: the breast, the back, and the



sides of the head and neck. Each of the three areas was designated between zero and four, where zero represents the typical color for *atrata* and four the typical color for *tephrocotis*. If the color was exactly intermediate between the types, it was given a score of two. The scores for the three areas were summed to give a total score for the specimen. Therefore, a total score of zero would be given a specimen of typical *atrata* color-

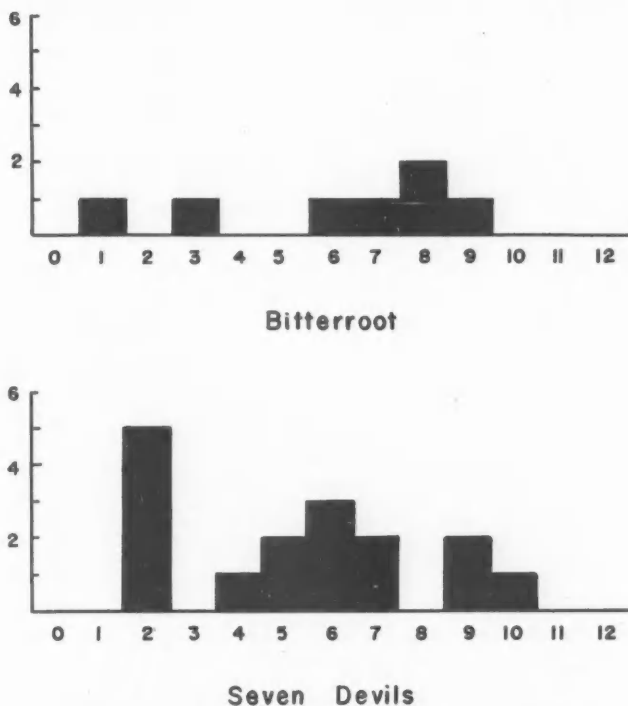


Fig. 1. Summation of scores for coloration of three body regions in specimens from two intergrade populations of rosy finches. 0 = typical *atrata*; 12 = typical *tephrocotis*; ordinate indicates number of specimens.

ation and a total of 12 to a specimen of typical *tephrocotis* coloration. Male specimens were compared with male *atrata* specimens from the Uinta Mountains of Utah and male *tephrocotis* specimens from Cascade County in Montana. Females were compared with females from the same localities. The results show considerable variation among the intermediate forms, but the birds from the Seven Devils Mountains tend slightly more toward the *atrata* condition, while those of the Bitterroot Mountains may be a little stronger on the *tephrocotis* side. Figure 2 shows a statistical comparison of measurements of males from the same populations represented in figure 1. The Bitterroot specimens are frequently nearer to the *atrata* condition whereas the Seven Devils specimens are more like *tephrocotis*.

These findings raise considerable doubt concerning the specific status of the Black

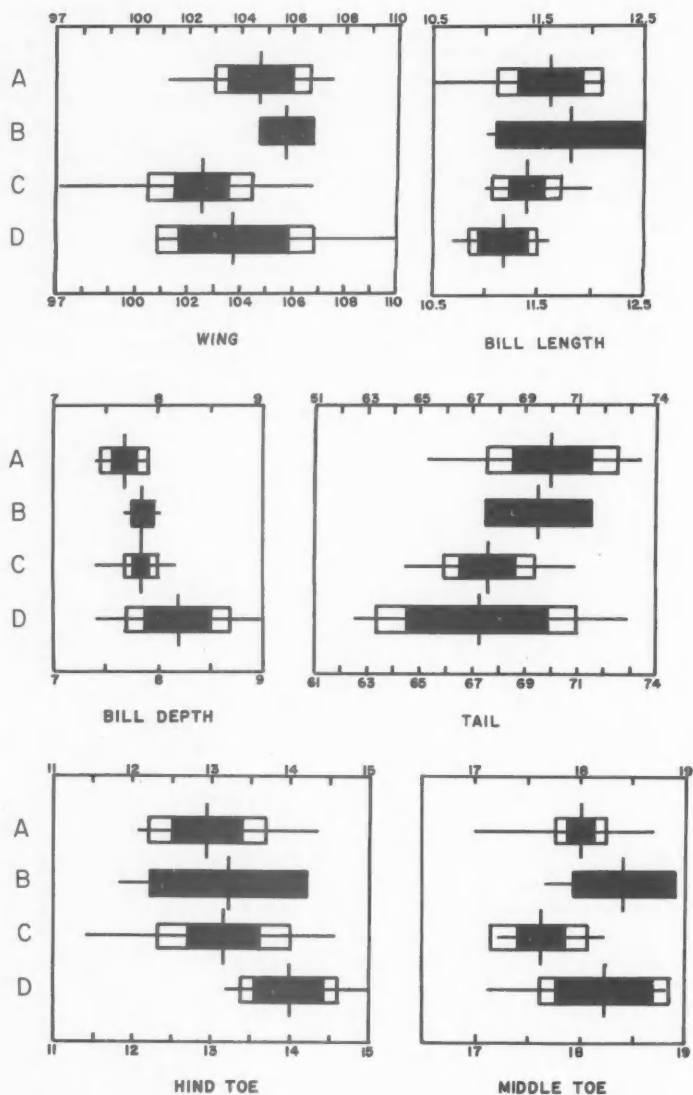


Fig. 2. Statistical analysis of measurements of male rosy finches from different populations; A = *atrata*, B = Bitterroot, C = Seven Devils, D = *tephrocotis*. Horizontal lines represent range; rectangles mark standard deviation with solid black showing twice the standard error of the mean.

Rosy Finch. Some authors have questioned the designation of *atrata* and related forms as separate species (Mayr, 1942:165, 229). A question is also raised concerning the rosy finch population in the Wallowa Mountains of eastern Oregon named *L. t. wallowa* by Miller (1939). This subspecies is duller and sootier in coloration than the typical Gray-crowned Rosy Finch. When Jewett (1924:78) first obtained rosy finches from the Wallowa Mountains, he also found a single male Black Rosy Finch there, although it was not in breeding condition. The specimens obtained recently from the Seven Devils Mountains came from a location no more than 40 miles distant from the Wallowa Mountains. A specimen (no. 27361) in the San Diego Natural History Museum taken in the Wallowa Mountains appears similar to some Bitterroot specimens and is suspected of having hybrid ancestry. Two others in the same collection (nos. 27359 and 27360) show this condition to a lesser extent, being more like dark *L. t. tephrocotis*. Specimens of *L. t. wallowa* in the MVZ collection were found to compare very favorably with certain intergrades from the Bitterroots, especially ♂ UU 13087 among males and ♀♀ UU 13079 and 13088 among females.

It is evident that there has been in the past occasional genetic interchange in these mountains similar to that which occurs in the Bitterroot and Seven Devils mountains but on a smaller scale. The duller and sootier coloration of the Wallowa birds may be accounted for by a slight influx in the past of genes producing characteristics of the Black Rosy Finch. These genes seem to be rather uniformly dispersed throughout the Wallowa population, indicating a greater stability here than in the populations of the Seven Devils and Bitterroots, or a more ancient zone of contact between the two forms of birds. Henceforth, the black form should be referred to as *Leucosticte tephrocotis atrata*. It follows that the population breeding in the mountains of Colorado may best be referred to as *Leucosticte tephrocotis australis*, although the habitat barrier isolating the breeding range of the latter form seems to be complete.

*Breeding range.*—Localities from which breeding Black Rosy Finches are known are shown in figure 3A. In addition to the Bitterroot Mountains, there are other localities in Montana where the Black Rosy Finch is known to breed. A single juvenal specimen, apparently *L. t. atrata*, from southern Granite County is in the Montana State University collection. A specimen in the Museum of Vertebrate Zoology comes from 23 miles northwest of Dillon, in Beaverhead County, and two others were taken near Cook in Park County. To this list may be added the Crazy Mountains in Sweetgrass County where, on July 22, 1954, three female Black Rosy Finches were collected near Conical Peak. Judging by the condition of the gular sacs (see French, 1954:83), these were feeding young. In July, 1957, breeding specimens were collected in the Madison Range in Gallatin County. In July, 1958, a pair of breeding specimens was collected in the Anaconda Range, 12 miles west of Anaconda, Montana. The male showed slight signs of intergradation with *tephrocotis*, and further collecting in this area is expected to reveal the presence of another intergrade population.

The breeding range of the Black Rosy Finch includes all of the major mountain ranges in northwestern and north-central Wyoming. The birds have been reported breeding in Yellowstone Park (Bailey, 1930:208-214), the Teton, Wind River, and Absaroka mountains (Cary, 1917:51) the Big Horn Mountains (Mengel and Mengel, 1952:61), and the Gros Ventre Mountains, lying between the Teton and Wind River ranges (Fuller and Bole, 1930, and a specimen in the University of Michigan collection, from Flat Creek divide). All of these have been verified during this study by collections and observations. In August, 1953, and again in July, 1954, I visited Medicine Mountain on the northern periphery of the Big Horn Mountains, the locality from which Mengel

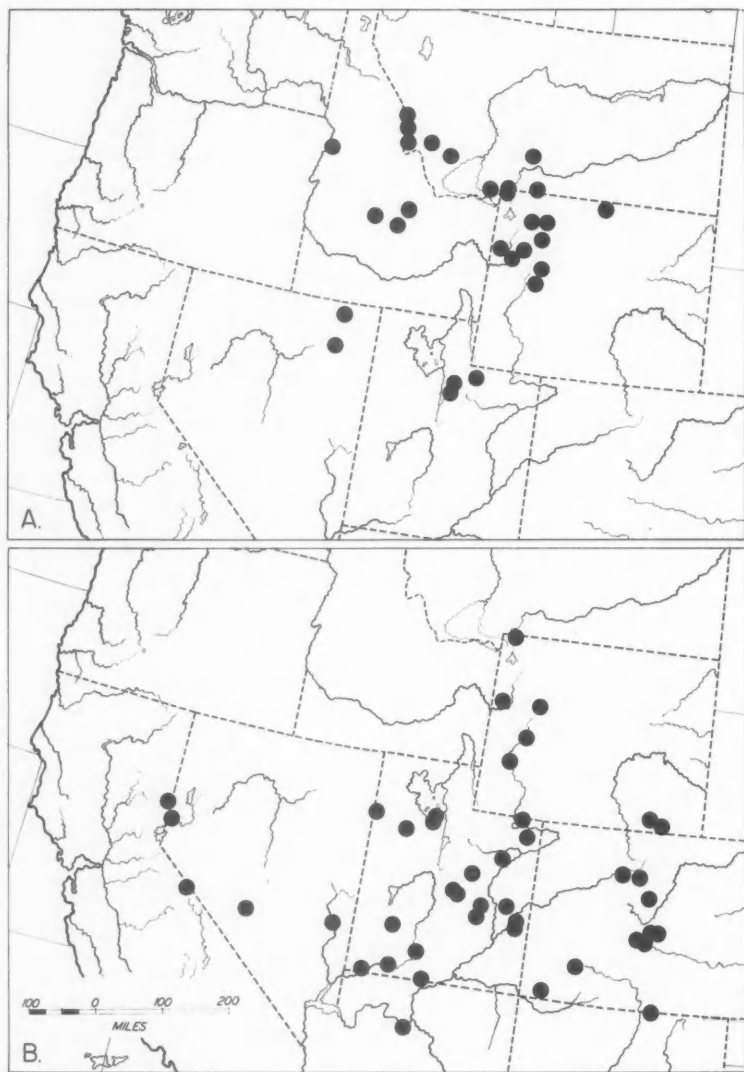


Fig. 3. A, breeding localities of the Black Rosy Finch; B, winter records of the Black Rosy Finch.

and Mengel (*loc. cit.*) reported adult and young Black Rosy Finches. The site was found to be barely high enough (9956 feet) to provide rosy finch habitat and this was separated by a distance of several miles from the main high peaks of the range. None of the birds could be found. In July, 1956, an effort was made to attain the higher regions of this range, and five male and three female Black Rosy Finches were collected at a point 5 miles north and 7 miles east of Cloud Peak, at an elevation of 11,300 feet.

In addition to the previously mentioned area of intergradation with the Gray-crowned Rosy Finch, two localities in central Idaho were found to be inhabited by the Black Rosy Finch. In July, 1955, specimens were collected on Snowsides Peak in the Sawtooth Mountains and on Borah Peak in the Lost River Range, both in Custer County. In early September, 1956, adults and young were observed slightly south of Hyndman Peak in the southern Sawtooth Mountains. Heretofore, references to this state have designated the Salmon River Mountains as the breeding habitat of the Black Rosy Finch, presumably on the authority of Merriam (1891:102). Most maps indicate the Salmon River Mountains as a vast region, sometimes including all of the mountainous country south of the main stream of the Salmon River and embracing nearly one-third of the State of Idaho. I have been unable to determine from his description of the region the exact location of Merriam's specimens.

Central Idaho is of particular interest because it lies between the breeding ranges of Black and Gray-crowned rosy finches. With the exception of the two locations where intergradation occurs, this region provides an effective barrier between the two forms. In the area between the Seven Devils on the west and the Bitterroot Mountains on the east, are low mountains that do not provide the alpine habitat required by breeding rosy finches. This region is to the north of the Salmon River, which nearly traverses the state from east to west approximately in line with the Seven Devils Mountains. South from the river one begins to find higher and more massive mountains which, when investigated, will probably be found to harbor breeding Black Rosy Finches.

The southern limits of the breeding range are found in Utah and Nevada. Black Rosy Finches have long been known to breed in the Uinta Mountains of northeastern Utah. The first record, a single specimen, was obtained in these mountains by a member of the Hayden Party on September 20, 1870. It was first referred to as the young of *L. t. tephrocotis*, although doubt was expressed at the time, and it remained for winter birds to be collected in Colorado before the original description of *L. t. atrata* was written (Ridgway, 1874). In the summer of 1953, rosy finches were observed continuously in the Uinta Mountains and found nesting in the vicinity of Bald Mountain and Mirror Lake, near the western end of this range.

Black Rosy Finches have been known to occur also in the Wasatch Mountains, slightly to the south and west of the Uinta Mountains and forming the eastern boundary of the valley of the Great Salt Lake. Breeding of the birds was established when adults and young were collected (Behle and Selander, 1952:31). In the fall of 1952, several trips to observe the autumnal behavior of the birds were made to Mount Timpanogos, where they were abundant.

Black Rosy Finches have been reported breeding in the Jarbidge Mountains in northeastern Nevada (Miller, 1955:306). In the Ruby Mountains south of Wells, Elko County, Nevada, in June, 1956, a party from the Museum of Vertebrate Zoology collected a series of 14 breeding Black Rosy Finches at Lamoille Creek, 9500 feet elevation, and Thomas Creek, 9000 feet elevation. In July, 1957, at 10,000 feet in the East Humboldt Range, a northward extension of the Rubies, I observed the species and collected one male in breeding condition at a location near Angel Lake, 13 miles south of Wells.

*Altitudinal limits.*—At the northern extremity of their breeding range Black Rosy Finches were found at elevations of 9300 feet and 9400 feet on St. Mary Peak and St. Joseph Peak, respectively, in the Bitterroot Mountains. Fifty miles to the south, on Trapper Peak in the same range of mountains, the birds were found only above an elevation of 10,000 feet. At each of these three localities rosy finches occurred at or near the summit of the mountain. In the Seven Devils Mountains of western Idaho, they were collected at 8000 feet. In central Idaho, Black Rosy Finches were found at 12,000 feet elevation in the Lost River Range and at 9500 feet elevation in the Sawtooth Mountains. At the southern extremity of their breeding range, in the mountains of northern Utah, they are rarely found below an elevation of 10,500 feet. In the Ruby Mountains of Nevada the birds occurred at approximately 9000 to 10,000 feet.

There seems to be no upward limit to the distribution of Black Rosy Finches in the mountains inhabited by them. If they are present in a particular range of mountains, they will be found near the summits of the highest peaks. This is to be expected when it is considered that related species of this genus occur at elevations of 17,000 and 20,000 feet in the mountains of central Asia. The minimum elevation which the Black Rosy Finch is known to inhabit is 9000 feet at the southern extremity and 8000 feet at the northern extremity of its range. These two localities are 300 miles apart. If the structure of the mountains is such that barren, rocky conditions exist at lower elevations, if they have an edaphic timberline, as in the Sawtooth Mountains, the lower altitudinal limit of the birds will move downward correspondingly.

*Winter range.*—In winter Black Rosy Finches are found mainly in Utah, Colorado, Nevada, and the southern half of Wyoming (fig. 3B). The northernmost record of regular winter concentrations of these birds is that of Bailey (*loc. cit.*) for Yellowstone Park. Joe and Mary Back of Dubois, Wyoming, reported that the birds are present in their area in winter. I have observed winter flocks including Black Rosy Finches near Jackson in western Wyoming. In addition, Haecker (1946) mentions Pinedale in Sublette County and La Barge in Lincoln County, and Knight (1902) says the first specimens known from Wyoming were taken at Sherman, which is the Union Pacific Railroad designation of the summit where their line crosses the Laramie Mountains between Laramie and Cheyenne. McCreary and Mickey (1935:130) consider this species casual or rare in southeastern Wyoming.

Records and specimens from central Colorado are numerous. The birds have been found regularly there throughout the winter roosting in caves and buildings in company with the Brown-capped Rosy Finch (*L. t. australis*) and other members of the *L. tephrocotis* group. In southwestern Colorado specimens have come from Mesa Verde in Montezuma County (Colorado Natural History Museum) and one from San Juan County (Princeton Museum of Zoology). Bailey (1928:697) records this species from New Mexico, very near the Colorado border (Vermejo Park).

In Utah records and specimens of the Black Rosy Finch come from nearly all parts of the state. They were found regularly in winter roosting in buildings and other structures west of Salt Lake City (see Behle, 1944:207). Many were banded here, as well as other specimens of *L. tephrocotis*, in the winters of 1952–53 and 1953–54. R. D. Porter, while studying at the University of Utah, obtained specimens as far west as Wendover, Utah. The southernmost records come from St. George (Fisher, 1893:83), near Zion National Park (U. of Michigan collection), and the Paria River near the Arizona border (U. of Utah collection).

A single observation of this form has been made in Arizona, at Grand Canyon (Townsend, 1925:178). The records from extreme southern Utah also support the view

that the Black Rosy Finch is a winter resident of northern Arizona. Specimens will probably be taken there when winter collecting is done in this area.

A specimen of the Black Rosy Finch from Tonopah, Nevada, is in the California Academy of Sciences collection. A winter observation of this form was made near Pioche in eastern Nevada (Gullion, 1957:71), and it was seen regularly at a winter roost near Reno (Johnson, 1956:151). Black Rosy Finches have been found at two localities in California, one at Bodie in Mono County (Swarth, 1928) and two in southern Lassen County (Miller and Twining, 1943).

Wintering flocks of rosy finches observed in southeastern Idaho during the last three years have never included *atrata*. On the basis of this, it is doubtful that Idaho can be considered as part of the regular winter range of this form, as indicated in the 5th edition of the A.O.U. Check-list (1957).

*Migration.*—The seasonal migration of the Black Rosy Finch is both latitudinal and altitudinal. In winter they descend to lower valleys considerably lower in elevation (4000 to 7000 feet) than their summer habitat.

The linear distance traveled in migration by these birds, when compared to other fringillid birds, is not great. Considering this distance as that from the southernmost breeding localities to the most southern localities where the birds are known to be common in winter (that is, northwestern or north-central Wyoming to southern Colorado, northern Utah to southern Utah and Colorado), it measures approximately 300 miles.

Flocks of rosy finches were studied during two winters in the vicinity of Salt Lake City. Banding records and field observations give indications of the forms present in the winter flocks. In both, the groups were considered as random samples of the entire local population and were used as an indication of the proportions of each of the three forms present. Figure 4 shows the percentage composition of the flocks by months for the winters of 1952–53 and 1953–54. There are three bars for each month. The height of each bar indicates the relative abundance of the species for the particular month. The three bars for any one month total 100 per cent.

Some interesting considerations about migration and winter movements are brought out by the graphs. The winter of 1952–53 was unusually mild in that area. Temperatures were generally above normal and precipitation was low. The winter of 1953–54 was nearer normal. The graphs (fig. 4) for the mild winter months of 1952–53 show that the Black Rosy Finch remained by far the most abundant form in the area throughout the winter. For the months of December through March it comprised 69, 80, 81, and 81 per cent of the population. In the normal winter of 1953–54, Black Rosy Finches were considerably outnumbered by individuals of one or both of the other forms, the Gray-crowned (*L. t. tephrocotis*) and Hepburn's (*L. t. littoralis*). The indication is that climatic conditions during a single winter can affect the distribution or winter range of the birds. Normally the center of the winter range of the Black Rosy Finch is farther south than Salt Lake City. In a mild winter, however, the winter range of the birds may shift slightly to the north. The opposite would probably be true during a hard winter. This interpretation is made without regard to possible cyclic fluctuations in population numbers. In order to establish the correlation with climatic conditions, continued observation would be required or simultaneous observation of winter roosts at different latitudes.

The fall migration from the mountains to the valleys took place in the latter part of October or early November. In the fall of 1952, the birds were regularly observed at higher elevations throughout October and as late as November 2. The first flock of rosy finches seen in Salt Lake Valley was on November 16. In 1953, the birds were first seen at Saltair, a regular winter roost of the rosy finches, on October 31.

In 1953, the return migration to the breeding grounds took place before the end of March. On the afternoon of March 28, two Black Rosy Finches were located only after considerable search at Saltair, where they had been numerous throughout the winter. On April 5 birds of this subspecies were observed at an elevation of 11,000 feet on Sugarloaf Peak in the Wasatch Mountains. Bleak winter conditions still prevailed at

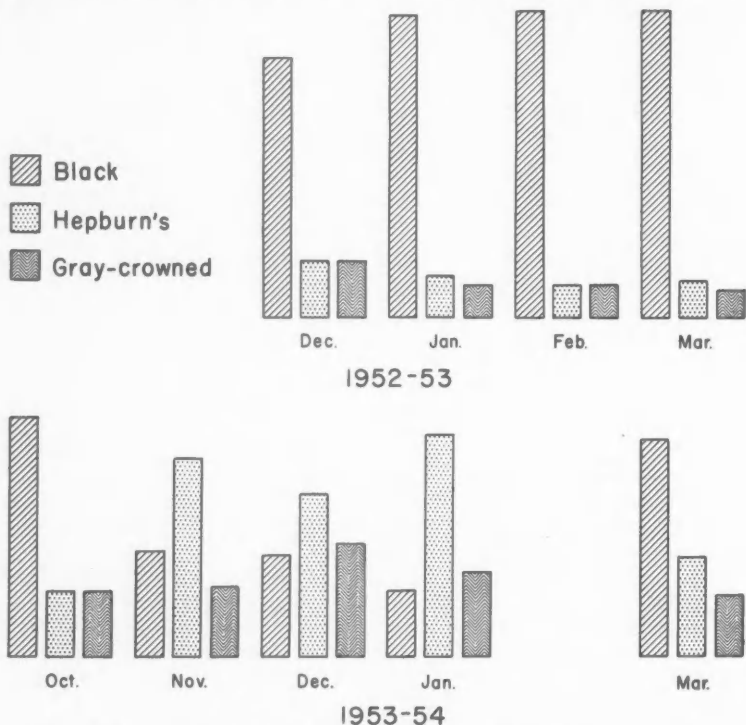


Fig. 4. Percentage composition of rosy finch flocks in northern Utah during the winter months of 1952-53 and 1953-54.

this elevation, although there was evidence of water having collected in small depressions and frozen again. After a week of stormy weather, the area was revisited. Areas that had been blown clear of snow before were covered with a heavy layer of new snow. Both the food and water supply of the birds had been temporarily removed, and no birds were found. Further evidence of the importance of water supply was the great affinity for moist gullies shown by flocks of rosy finches on several occasions in the fall when the lakes and streams at high elevations remained frozen during the day.

The assumption is that the lack of free water at high elevations is the critical factor which forces rosy finches to lower elevations. The early migration back to the breeding grounds is a result of internal physiological changes. Frequent spells of bad weather at that time of year may freeze all standing water or cover the food supply, periodically and temporarily forcing the birds back to lower elevations.



*Barriers to dispersal.*—Black Rosy Finches were always found associated with extensive tundra and open park-like areas above or near timberline in the mountains. In addition there must be extensive rocky cliffs and precipices where quantities of snow accumulate in the winter and where some of it is sheltered throughout the summer. The birds utilize the snow banks as well as the tundra and open areas for feeding and the cliffs for nesting and roosting. The composition of the rock seems to be unimportant to the birds so long as the cliffs are high, steep and broken enough to provide cracks and small openings for shelter.

It has already been mentioned that the barrier to the north of the breeding range is incomplete. Extensive low regions separate the Black Rosy Finches in northwestern Wyoming from the Brown-capped Rosy Finches in the mountains of southeastern Wyoming. A similar situation exists between the birds of the Uinta Mountains and those in the mountains of Colorado. The southward and westward spread of Black Rosy Finches in Utah and Nevada is also prevented by extensive low areas broken only here and there by isolated mountain ranges, some of which attain elevations required for the existence of tundra. When it is considered that these areas are well within the winter range of the species the question arises as to why some individuals have not become established there. The limiting factors seem to be aridity, area, and lack of rock outcrops for nesting. The latter may be dependent upon the former, since glacial action is primarily responsible for steep rugged mountain peaks.

Behle (1955:29) did not find Black Rosy Finches in the Deep Creek Mountains of western Utah. I inspected this range in June, 1956, and found what appeared to be good rosy finch habitat about the highest peaks, but no rosy finches were found. Since these mountains are at nearly the same latitude as the Wasatch Mountains and since they are high enough and apparently have abundant cliffs, one explanation for the lack of breeding rosy finches seems to be the limited size of the area. An individual rosy finch will cover considerable area in its breeding habitat. In a single flight, a bird frequently travels well over a mile and perhaps much farther. If the bird cannot make several such flights in succession it may very well be crowded. The area required by an individual would be multiplied many times by a breeding population.

The second factor, that of aridity, may also enter into the situation in the Deep Creek Mountains. There are probably seasons when the snow does not remain on the high ridges throughout the summer and fall. If all available water disappeared at the end of the breeding season when the young are out of the nest, are most demanding of the environment, and are most susceptible to enemies, the resulting mortality would seriously reduce or even nearly exterminate the breeding population. Since drainage away from the alpine region is rapid, unless water is stored in lakes and ponds, there may be drought between the melting of the last snow and the autumn rain or snow. Lakes and ponds generally seem to be numerous only in the more extensive mountain areas. Rosy finches are known to utilize the water from melting snow almost exclusively in some localities. It has already been suggested that available free water may have a great deal to do with the fall migration to lower elevations.

The La Sal Mountains in southeastern Utah were expected to harbor breeding rosy finches, especially since these mountains are within sight of the massive San Juan Mountains in Colorado where the Brown-capped Rosy Finch is known to breed (G. Alexander, personal communication). The La Sal Mountains have peaks of 13,000 feet elevation, few of which have cliffs suitable for nesting. As in the case of the Deep Creek Mountains, aridity may also be influential in preventing the establishment of a rosy finch population in these mountains.

The most noticeable avifaunal difference between the high La Sal Mountains and areas where rosy finches occur is the abundance of White-throated Swifts (*Aëronautes saxatalis*) around the mountain tops. Ordinarily the swifts are found at rather low elevations compared to those frequented by the rosy finches. There would be only intermittent competition for food if the two species occurred together but they nest in similar situations and hence the two could conceivably compete for space. Whether this is the case, or whether the presence of the swifts indicates some other fundamental difference in habitat, is not clear.

It is doubtful that climatic conditions have any direct limiting effect on the distribution of the Black Rosy Finch other than upon the seasonal movements of the form. The birds seem to thrive under the most extreme conditions of temperature and weather and under such circumstances are particularly adept at sheltering or protecting themselves. It is likewise doubtful that food may be a limiting factor. In known habitat there are not enough birds to fill the available space and to take full advantage of the existing food supply. Rearing birds in captivity has shown that they will accept almost any kind of seed so long as it is of the proper size and not too hard to be crushed in the bill.

#### SUMMARY

The Black Rosy Finch (*Leucosticte tephrocotis atrata*) was found to intergrade with the Gray-crowned Rosy Finch (*L. t. tephrocotis*) in the Bitterroot Mountains of the Montana-Idaho border, and the Seven Devils Mountains on the Idaho-Oregon border. It is believed that the dark *willow* population of *L. tephrocotis* is a result of similar intergradation and that *atrata* and *australis* should be considered as subspecies of *L. tephrocotis*. The breeding range of the Black Rosy Finch includes the high mountains of southwestern Montana, northwestern and north-central Wyoming, central Idaho, northeastern Utah and northeastern Nevada. In winter it is found primarily in Utah, Nevada, Colorado and the southern half of Wyoming. Black Rosy Finches migrate to lower elevations in winter and at least 300 miles southward. The movement to lower elevations may be stimulated by a lack of water in the alpine habitat. Lack of habitat ensures the separation of breeding Black Rosy Finches from breeding Brown-capped Rosy Finches (*L. t. australis*) in Colorado and southeastern Wyoming. Aridity, small area of available habitat, or lack of precipitous cliffs for nesting seem to prevent the birds from populating the several isolated mountainous areas farther south and west of their breeding range.

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*U. S. Atomic Energy Commission, Idaho Falls, Idaho, October 13, 1958.*

## A METHOD FOR DETERMINING AGE OF NESTLING HERONS IN JAPAN

By H. ELLIOTT McCCLURE, M. YOSHII, Y. OKADA, and W. F. SCHERER

In 1956 a method was needed to determine the age of nestling ardeids for ecologic studies of Japanese encephalitis virus near Tokyo, Japan. An attempt was therefore made to correlate nestling size with age by measurement of the growth of selected anatomical structures in ardeids of known age. The birds chosen for study were the Black-crowned Night Heron (*Nycticorax nycticorax*), Plumed Egret (*Egretta intermedia*), and Little Egret (*Egretta garzetta*). The resulting data are presented here because they are primarily of ornithological interest.

Little information has been recorded in the literature concerning growth of ardeid nestlings, aside from the report of Adams (Condor, 57, 1955:55-60) who studied the skeletons of 41 adult Black-crowned Night Herons and found that male bones were slightly longer (less than 2 per cent) than those of females.

## LOCATION AND METHODS OF STUDY

Observations were made at two large heronries within ten miles of Tokyo. One colony was at the Shinhama Imperial Duck Netting Grounds where the abundant ardeids in summer were Black-crowned Night Herons, Little Egrets, and Plumed Egrets. Nests were built in low bamboo (*Pleioblastus simoni*) and red pine (*Pinus densiflora*). At the other colony known as Sagiya, Plumed Egrets, Black-crowned Night Herons, Little Egrets as well as Cattle Egrets (*Bubulcus ibis*) and Great Egrets (*Egretta alba*) nested in large *Zelkova japonica*, *Shiia siedoldii*, *Phyllostachys nigra*, and other trees in five farm yards.

At Shinhama in 1956, Black-crowned Night Herons, Little Egrets, and Plumed Egrets were marked on the day of hatching, banded when 10 days old, and measured repeatedly until they disappeared from the region of the nest. Bands were kindly supplied by the Japanese Game Management Bureau. Unfortunately every bird could not be measured every day since the observers' work periods were limited to five days a week and nestlings older than 10 days often climbed from the nest and hid at the approach of the field men. As a result, most nestlings were measured three or four times during the first two to three weeks of life.

Three anatomical parts were measured by means of calipers graded in millimeters: (1) upper mandible, from the forward corner of the eye (tear duct) to the tip of the beak, (2) tarsus, from the bend of the heel to the base of the phalanx, and (3) third primary wing feather, from the skin attachment to the tip. Initially the wing was measured from the base of the humerus to the tip of the third primary wing feather, but these measurements were soon stopped because the values obtained by different observers varied widely depending upon the position of the wing at the time of measurement.

At both Shinhama and Sagiya in 1956, tarsal and third primary wing feather measurements were made of the three species mentioned previously. These were captured at weekly intervals for procurement of blood for Japanese encephalitis virus tests. When the measurements of a bird showed its age to be less than one week (by comparison with data from birds of known age), subsequent measurements were recorded and used to compile tables 1-3.

## RESULTS

The growth curves for the tarsus, third primary wing feather, and mandible of Black-crowned Night Herons, Plumed Egrets, and Little Egrets during the first 24 to 26 days of life at the Shinhama heronry are shown in figures 1 to 3. It can be seen that at the time of hatching, the tarsus and mandible already had length and grew continu-

Table 1

Average Age of Black-crowned Night Herons Based on Length of Tarsus  
and Third Primary Wing Feather

Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days	Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days
0	20	21	1	70	75	16	17
	25	6	3		80	23	19
	30	7	5		85	11	19
	35	11	7		90	4	21
	40	5	8				
5	35	1	7	80	75	18	20
	40	9	7		80	17	21
	45	12	8		85	12	21
					90	2	22
10	35	1	7	90	75	3	22
	40	2	8		80	3	22
	45	5	9		85	9	23
	50	13	9		90	5	23
15	50	5	9	100	75	2	21
	55	10	11		80	16	22
	60	2	11		85	6	21
20	50	2	13*		90	8	24
	55	8	10		95	2	27
	60	6	13	110	80	6	26
	65	3	13		85	10	24
25	55	2	10		90	8	25
	60	10	12	120	80	2	23
	65	10	14		85	3	26
30	60	5	13		90	6	27
	65	12	13		95	4	28
	70	6	15	130	85	2	28
35	65	11	14		90	1	28
	70	12	14		95	1	29
	75	6	15	140	85	2	30
40	65	9	14		90	4	29
	70	16	15		95	2	32
	75	12	16	150	85	2	31
50	65	6	14		95	9	34
	70	23	15	160	85	2	35
	75	23	16		95	1	40
	80	6	17	170	85	1	35
60	70	9	16	180	85	1	42
	75	18	16		90	2	42
	80	20	18	190	85	1	42
	85	8	21				

\* Failures of the age to increase uniformly as the anatomical structures lengthen results from the use of small samples of birds and from variations in measurements among individual birds of the same age.

Table 2  
Average Age of Plumed Egrets Based on Length of Tarsus  
and Third Primary Wing Feather

Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days	Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days
0	20	17	2	90	85	3	28
	25	24	3		90	5	24
	30	12	5		95	2	26
	35	7	6		100	4	26
	40	11	8		110	1	27
	45	1	9	100	95	4	28
5	35	4	8		100	5	26
	40	6	8		105	2	26
	45	17	9	110	95	3	29
	50	6	10		100	6	30
55	2	11	105		6	28	
10	45	4	10	120	90	1	29
	50	7	11		95	1	29
	55	5	10*		100	4	30
15	50	2	11		105	3	30
	55	6	12	110	5	31	
	60	7	13	130	95	2	31
20	50	2	12		105	2	37
	55	3	13		110	2	33
	60	11	14		120	2	33
	65	8	14	140	100	3	35
25	60	6	15		105	4	34
	65	3	16		110	5	33
	70	3	15		115	6	35
30	55	1	13		120	2	36
	60	2	14	150	100	1	36
	65	3	15		105	2	40
	70	5	15		110	7	38
35	60	1	15		115	8	39
	65	2	16		120	4	39
	70	9	17	160	110	11	45
	75	5	17		115	7	45
	80	2	17		120	4	47
40	70	3	17		130	1	55
	75	5	18	170	110	3	49
	80	5	19		115	2	46
	50	70	1		17	120	3
75		4	18		125	1	50
80		11	19	180	105	2	50
85		5	20		110	3	53
60	75	4	21		120	4	54
	80	1	20	190	110	3	58
	85	7	20		120	2	55
	90	2	22		125	3	59
	70	80	2		22	130	2
85		7	22	200	110	2	64
90		4	23		125	1	70
80	85	5	23		130	3	60
	90	7	23	210	120	2	60
	95	3	23		220	115	1

\* See footnote, table 1.

Table 3  
Average Age of Little Egrets Based on Length of Tarsus  
and Third Primary Wing Feather

Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days	Third primary wing feather length in mm.	Tarsal length in mm.	Number of birds per measurement combination	Average age in days
0	30	2	6	90	80	5	23
	35	2	6		85	3	24
5	35	2	8	100	80	1	26
	40	2	10		85	4	27
10	45	4	10		90	4	28
15	45	4	10	110	80	4	27
	50	3	11		85	3	28
20	45	2	10		90	2	29
	50	1	12		95	2	29
	55	3	14	120	80	2	28
25	55	5	14		90	1	29
	60	4	15		95	7	32
	65	2	16		100	3	32
30	55	2	14		105	1	32
	60	1	15		110	3	33
	70	1	17	130	85	1	30
35	60	1	15		90	3	31
	65	2	17		95	4	33
40	65	5	17		100	1	33
	70	1	17		110	1	35
50	60	2	15	140	85	1	32
	65	3	17		100	1	34
	70	2	18		115	1	39
	75	1	18	150	95	3	33
	85	2	20		100	1	34
60	65	1	20		105	2	35
	70	1	20	160	100	1	39*
	75	3	20		105	3	38
	80	4	22		110	2	40
	85	1	23	170	105	1	40
70	65	1	21		110	2	40
	70	1	21		115	3	42
	75	2	21	180	100	2	35
	80	8	22		105	1	42
	85	3	23		120	1	50
80	70	1	22	190	95	1	51
	75	1	22		100	1	42
	80	7	23	200	105	1	55
	85	4	24		115	1	50

\* See footnote, table 1.

ously until full size was reached sometime after three weeks of age when the birds fledged. The tarsus of Black-crowned Night Herons grew slower than the tarsus of the other species; this result was expected, since the leg of the adult of the Black-crowned

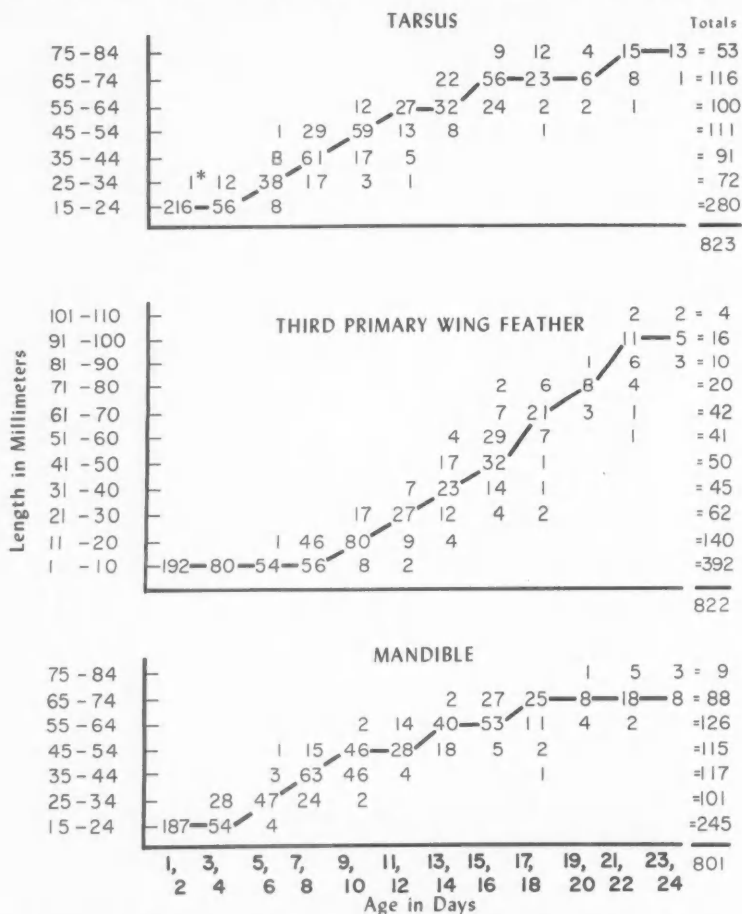


Fig. 1. Growth of the tarsus, third primary wing feather, and mandible in Black-crowned Night Herons (*Nycticorax nycticorax*) of known age. Asterisk indicates number of birds of known age with measurements indicated by the ordinate.

Night Heron is shorter and heavier than that of the egret. The mandibles of each species grew at about the same rates and reached the same lengths by the 24th day of life.

Growth of the third primary in each of the three species was very rapid, producing a steep curve (figs. 1-3). This feather continued to grow after the young fledged and after tarsal and mandibular growth stopped. The fact that the third primary did not begin visible growth until several days after hatching helped in determination of the



age of small herons and egrets. Black-crowned Night Herons without primary pin feathers were less than 5 to 6 days old, Plumed Egrets less than 9 to 10 days, and Little Egrets were less than 7 to 8 days of age. For more accurate age determination within the first week after hatching, the tarsal data were used.

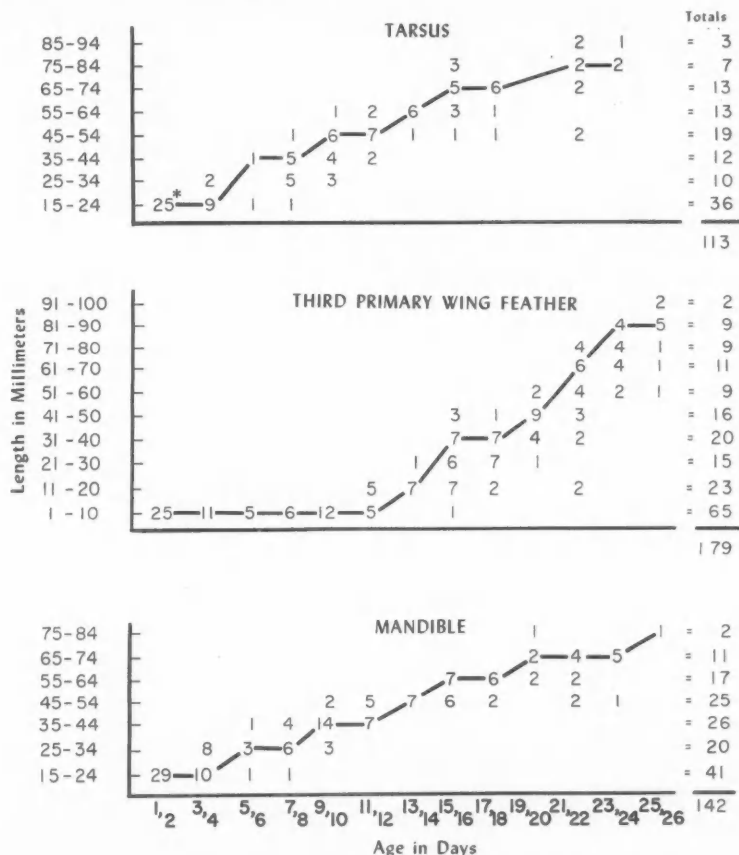


Fig. 2. Growth of the tarsus, third primary wing feather, and mandible in Plumed Egrets (*Egretta intermedia*) of known age. Asterisk indicates number of birds of known age with measurements indicated by the ordinate.

"Yard sticks" for ageing of the three species are presented in tables 1-3. These tables give the average age of birds based upon tarsal and third primary lengths and serve as compact sources of information for ageing ardeids in the field. Considering the variations in growth of individual birds and the inherent inaccuracies of measurements, discrepancies in the tabulated data were expected and indeed are present. Nevertheless, these tables provide a basis for ageing of juvenal birds of the three ardeids quickly.

## DISCUSSION

Structural differences among individual birds of the same age made it difficult to establish a precise means for ageing nestling ardeids. Competition among siblings for food undoubtedly affected their growth and may account for structural differences and for some of the variations in results among birds of the same age. In addition the

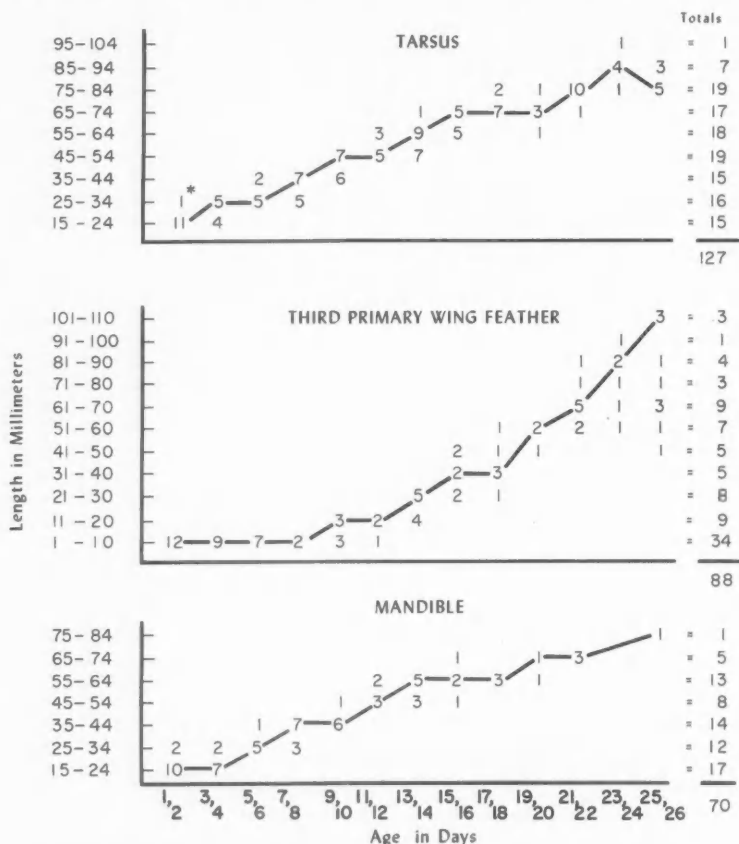


Fig. 3. Growth of the tarsus, third primary wing feather, and mandible in Little Egrets (*Egretta garzetta*) of known age. Asterisk indicates number of birds of known age with measurements indicated by the ordinate.

somatic growth of young ardeids was influenced by various environmental and physiologic stimuli. Ardeids are primitive enough or flexible enough in their growth responses to permit wide variations in growth rate and yet sustain survival of young. Black-crowned Night Herons were especially hardy and lived even under adverse nestling competition. For example, when birds which hatched late and were half the size of their

siblings were deserted by the parents after the rest of the family had fledged, they often moved to another nest.

Yet despite factors such as these that affected the growth of individual ardeid nestlings, it was possible to obtain data that permitted more accurate ageing of ardeids by measurements of the lengths of selected anatomical structures than by gross observations of over-all body size and development. The tables and figures presented herein provide a standard method for ageing ardeid nestlings that can be used by persons untrained in ornithology and that will not vary from year to year with changes in personnel. These attributes of a method for ageing ardeids were important and necessary for its use in ecologic studies of Japanese encephalitis virus, requiring as they do repeated yearly field observations by changing personnel.

#### SUMMARY

During the summer of 1956, the lengths of the tarsus, third primary wing feather, and upper mandible of nestling Black-crowned Night Herons, Plumed Egrets, and Little Egrets at the Shinhama heronry near Tokyo, Japan, were correlated with age during the first 24 to 26 days after hatching (that is, until the birds fledged and could not be captured). Over 3000 measurements of these birds were made at the Shinhama and Sagiya heronries near Tokyo during the summers of 1953, 1956, and 1957. It was found that birds without measurable third primary wing feathers were less than a week old and that the tarsal and mandibular lengths were useful in determining their age more precisely. At ages between 7 and 24 to 26 days, the length of the third primary wing feather proved most valuable for ageing ardeids. Tables and figures are presented for quick and easy field use in ageing nestling Black-crowned Night Herons, Plumed Egrets, and Little Egrets from measurements of tarsal and third primary wing feather lengths.

*United States Army Medical Research Unit, Institute for Medical Research, Kuala Lumpur, Malaya, June 20, 1958.*

## A STUDY OF VARIATION IN FEATHER PIGMENTS OF THE WRENTIT

By DARL E. BOWERS

Much has been written about the structure and pigmentation of the feathers of birds; see, for example, papers of Strong (1902), Lloyd-Jones (1915), Frank (1939), Lillie and Wang (1941), Watterson (1942), and Auber (1955, 1957). The more recent of Auber's two papers summarizes information on structural colors and unusual pigmentation in the entire class Aves. However, little is found in the literature concerning variation in feather pigmentation of closely related birds at the microscopic level.

The Wrentit (*Chamaea fasciata*), restricted to the west coast of North America, has been subdivided into six races, largely on the basis of color. The birds of northern California and especially those just north of the San Francisco Bay area, form a series of three races with the darkest birds, *C. f. rufula*, along the coast, and the lightest birds, *C. f. henshawi*, interiorward, on the west slope of the Sacramento Valley. A race of intermediate coloration, *C. f. intermedia*, occurs in Sonoma, Napa, and Lake counties between the two extremes. An analysis of the macroscopic color gradients found here have been reported elsewhere (Bowers, 1956, and in press). The colors of the aggregate breast feathers of these birds show a considerable color gamut running from vinaceous-buff to army brown in the terms of Ridgway (1912), or in more precise colorimetric specifications of the Munsell color system (Munsell, 1954), from 10.0 YR 6.3/3.0 to 6.7 YR 4.2/3.5 (pale brown to moderate brown). The color gradation between these extremes runs generally westward from light to dark.

If sample breast feathers from birds of the extreme regions of this color gradient are mounted on microscope slides with piccolyte and cover slips, one notices differences in the degree of pigmentation present in the barbules. These barbules lack barbicels of any kind. Because of this lack, the feathers are extremely soft and fluffy and are called semi-plumes. This makes it relatively easy to observe and measure individual barbules and to make drawings of the location of the pigment granules. Color designations when one is using a microscope (approx. 440 $\times$ ) are difficult to make since there is much color aberration and refraction around edges that confuse the observer's color sense. Pigment granules, taken individually, do appear similar in the different feathers studied. But the distribution of pigment, assumed to be chemically equivalent in the various feathers examined since these birds are all of the same species, shows an interesting correlation with the macroscopic color gradation of the breast feathers viewed en masse. These feathers, the barbules of which contain pigment clumps corresponding to the cells in the cell-chains of which they are composed, are largely transparent horny material. The cortices of barbs and barbules contain the pigment but the medullae of the barbs appear refractory and dark by transmitted light and without color. Pigment in the barbs appears evenly distributed where it can be seen and is not easily measured.

In the darker birds, the brownish pigment clumps are larger and more densely packed than in the lighter birds, with less of the transparent parts of the barbules showing. Figures 1 and 2, drawn with the aid of a camera lucida, show the differences to be seen in these feathers.

In order to obtain a more objective statement of these differences in pigment distribution, series of measurements were made of the pigment masses as they appear under the microscope at an enlargement of approximately 440 diameters (4mm. dry objective and 10 $\times$  ocular). As one looks at the barbules in this way, one sees the pigment as a dark body within the relatively transparent horny material of the feather. By using an ocular micrometer, one can measure the various dimensions of the color mass and the

barbule itself. One can arrive at a figure that represents the portion of the feather structure filled with pigment as seen in this one view. These data, expressed in percentages, can be compared with data taken from other feathers to bring out differences that exist. Figure 3 shows diagrammatically the measuring scheme. The length "b" is an arbitrary

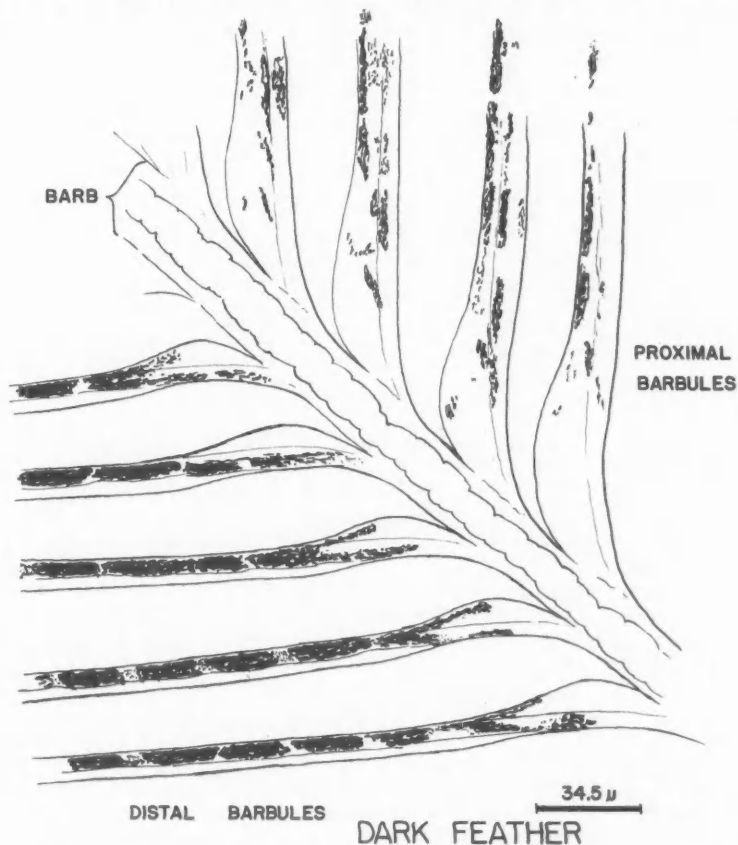


Fig. 1. View of portions of intact feather of a dark Wrentit, drawn with the aid of a camera lucida.

rary unit used for the sake of convenience. From this,  $xy/ab$  equals the proportion of the barbule segment pigmented as seen in this two-dimensional projection by transmitted light. There is no need to bring into the measurements the third dimension, since in comparing like measurements in similar sized feathers, such a figure would simply cancel out.

In practice, it became evident that short cuts could be made to facilitate the measuring. The ocular micrometer used is divided into large units appearing  $\frac{1}{30}$ th mm. apart at the magnification used, and each of these is subdivided into ten small units. Barbules

averaged quite consistently two of these small units in width. Since this width ( $a$ ) is fairly constant in the portions of the barbules measured, the widths of the pigment masses ( $x$ ) were estimated visually as a proportion of the barbule width and recorded as the nearest tenth of that barbule width. Also, since it was easier to keep one's place in the microscope field by noting the numbered large divisions of the ocular micrometer rather than numbering the individual masses of pigment, the lengths of the masses ( $y$ )

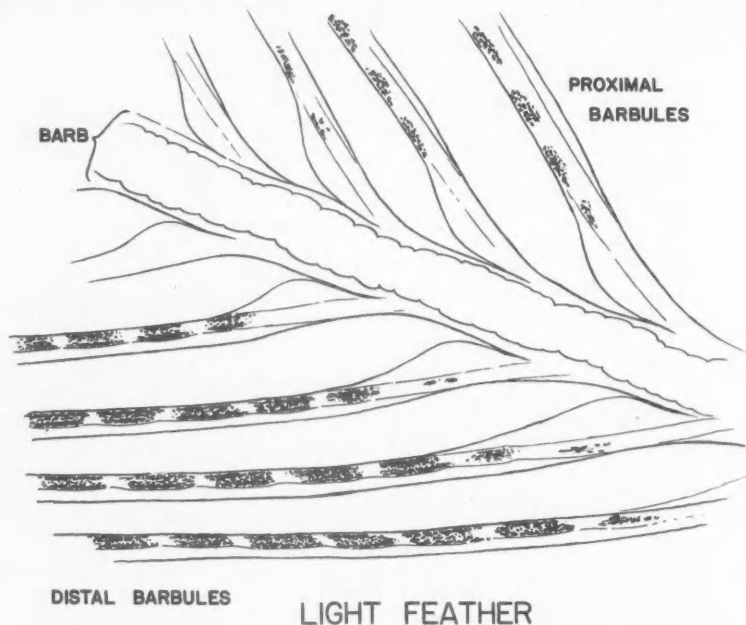


Fig. 2. View of portions of intact feather of a light Wrentit, drawn with the aid of a camera lucida.

were then measured as the number of small units per large unit ( $b$ ) that were filled with pigment regardless of the number of masses falling within the measuring unit and recorded as the nearest tenth of the large division. The average percentage of each barbule area ( $ab = 2 \times 10 = 20$  square units) filled with pigment is given by:  $xy/abn$  where  $n$  equals the number of " $b$ " lengths measured, or:

$$\begin{aligned} P &= (xa \cdot yb + x'a \cdot y'b + x''a \cdot y''b + \dots x^na \cdot y^nb) / abn \\ &= ab(xy + x'y' + x''y'' + \dots x^ny^n) / abn \\ &= (xy + x'y' + x''y'' + \dots x^ny^n) / n \end{aligned}$$

One assumption necessary for this procedure was that the barbules be roughly cylindrical in cross section so that they present a relatively constant diameter to the viewer regardless of their position. As can be seen in the composite drawing, figure 4, this is not true. The barbules are flattened cylinders with a flange protruding along the barbule on the side of the feather away from the bird's body. In viewing intact feathers, the barbules are seen nearly on edge, as shown in figure 4, so that most of the time the

flange did not contribute to the width of the barbules measured. Since most of the barbules measured 6.7 micra (2 units on the micrometer, dimension "a") as seen in the intact feather, it is considered that reasonable consistency was followed in the measurements. Moreover, the same techniques were used in measuring both light and dark feathers, with the same kinds of errors present in both sets of data, and since our purpose here is one of comparison, such errors as there are tend to cancel out in the end.

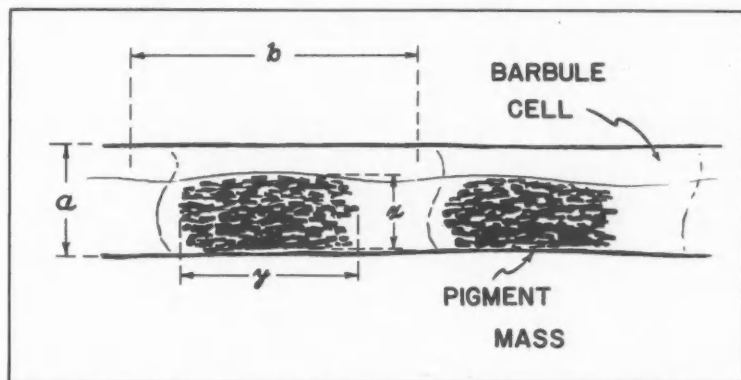


Fig. 3. Diagram of a barbule of the Wrentit showing the pigment measuring scheme.

Another complication is the fact that the pigment masses themselves are not cylindrical but are concave toward the center of the barbules, as can be seen in figure 4 showing cross sections. The view of these clumps in the intact feather was thus not always the same from barbule to barbule. In most cases, the pigment clump was seen next to the side of the barbule as it would be when viewing the barbule from its edge, but varying amounts of overlap of the two extreme edges of the clump may have obscured the true extent of the pigmentation in terms of its dimension "x." Here again, the consistency in measurement technique with the different feathers is called on to offset this possible source of error.

Further difficulties in the method revolved around the fact that the feathers to be measured were not sectioned, but were quite thick in terms of the depth of field available at the magnification used. There was refraction at the boundaries of the feather substance that occasionally confused the observer. The various focal planes possible in such a thick object gave different impressions from level to level. Measurements represent, in some cases, compromises in the appearances of the edge positions.

Pigment clumps are not uniform masses of material, but are composites of pigment granules, oftentimes not closely packed, but with spaces between. Wherever these spaces were obvious, the pigmentation was visually compacted so as to make it more of a "clump" of "uniform" consistency.

There are probably more elegant ways of getting at the amount of pigmentation in these feathers. One that comes to mind is the extraction of pigment from a given feather volume and analyzing the resultant extract with some sort of colorimeter. This method, too, would have its drawbacks and the end results probably would be no more significant than those presented here.

There are some details of the pigmentation pattern that are of interest. The distal barbules, which lie on the side of the barbs closest to the main shaft of the feather, are

more heavily pigmented in all feathers examined than the proximal barbules that lie on the side of the barbs away from the main shaft. This pattern is apparently symmetrically arranged with respect to the main shaft so that each side of the vane is comparable to its opposite.

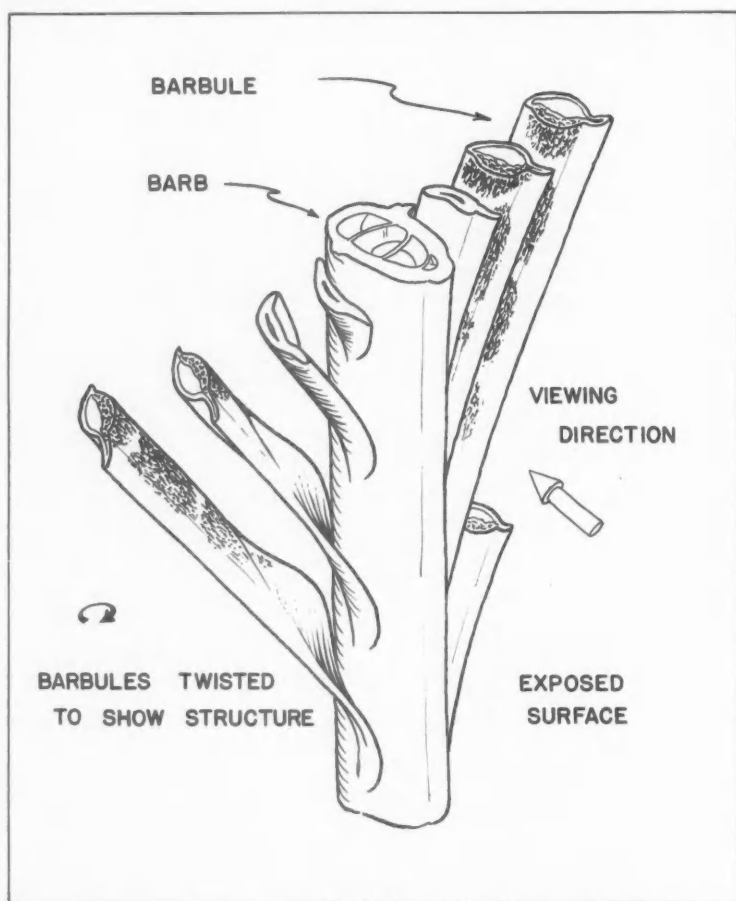


Fig. 4. Composite drawing of a portion of a breast feather of the Wrentit showing cross sections of barb and barbules.

Barbules near the base of the feathers are completely different from those toward the tip. These basal regions appear gray in the intact feather and are usually hidden by overlapping feathers as they lie in place on the breast of the bird. These basal barbules are filled with tear-drop shaped masses of a dark gray or black pigment with their pointed ends toward the base of the structure in which they exist. These barbules are cylindrical in cross section, and the pigment is likewise centrally located and cylindrical in cross



section. There is no apparent difference between the feathers of light and dark birds in this pigmentation (see fig. 5).

A feather from the central breast region of a Wrentit collected in Marin County, December 20, 1951, was used to represent the darkest birds of the color gradient. Another feather from the same breast region of a bird collected in Solano County, Decem-

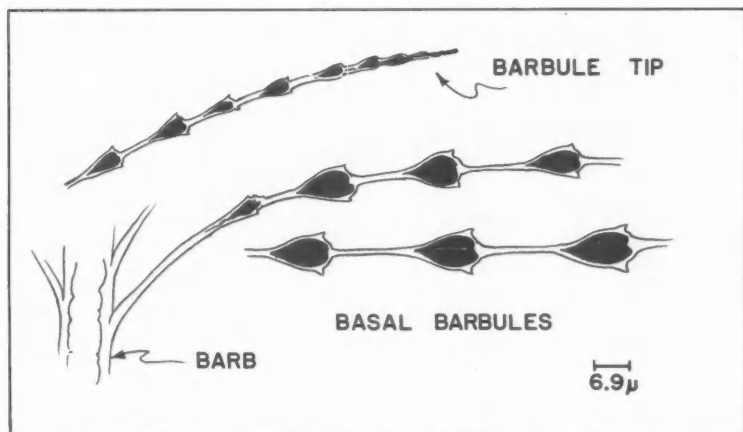


Fig. 5. Drawing of barbules of the Wrentit from the basal part of a breast feather.

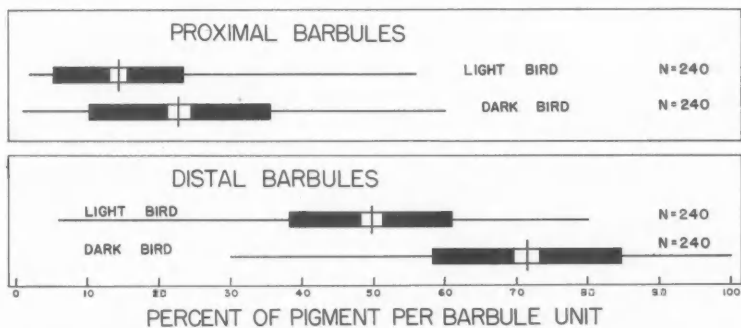


Fig. 6. Dice graphs showing percent of pigment per barbule unit in the Wrentit. Means are represented by vertical lines, standard deviations by solid bars, twice the standard error of the means by the open bars, and the range by the horizontal lines.

ber 11, 1951, was used as a sample of the lightest birds of the color gradient. Both were adult males in fresh plumage having just recently gone through the postnuptial molt. On each of these feathers, the barbules of the fifth and seventh barbs, counting back from the tip of the feather, were measured as a sample of the portion of the feather

showing when in position on the bird. A linear distance of  $8000\mu$  (8 mm.) was measured on proximal barbules and an equal length was measured on distal barbules. Approximately half of each of these was from one side of the main vane and half from the other

Table 1

	Percentage of Pigment per Barbule Unit			
	N units	Range	Mean	Standard deviation
Proximal barbules				
Light bird	240	2-56	$14.4 \pm 0.6$	9.0
Dark bird	240	1-60	$22.9 \pm 0.8$	12.6
Distal barbules				
Light bird	240	6-80	$49.7 \pm 0.7$	11.4
Dark bird	240	30-100	$71.6 \pm 0.8$	13.1

side. The results of these measurements are shown in figure 6 expressed as percentages of barbule unit areas that appeared filled with pigment granules. Table 1 gives the data from which these graphs were drawn.

By inspection of these data, it is evident that there is considerable difference between comparable parts of the two representative feathers. In both proximal and distal barbules, the differences between the two feathers have a P value less than 0.0001. At the microscopic level, pigmentation patterns match those shown in gross aspect of the breast plumage of these birds.

The controlling influences in the birds, very likely of an hereditary nature, can be envisioned as working at the cellular level in the production of more pigment material in those birds living in the more humid and darker environments found along the coast, and conversely in the production of less pigment in those birds living in more arid and lighter environments found inland. It may be postulated that only a few hereditary factors are necessary to bring about these differences which appear to be largely quantitative rather than qualitative. There is little, if any, evidence to substantiate this position for the races of birds, but for other vertebrates, mammals especially, there have been studies to indicate that pelage coloration is under the control of hereditary factors, producing under the agency of natural selection coloration that may be of adaptive advantage in the variously colored backgrounds against which animals are viewed by predators.

#### SUMMARY

A study has been made of the feather pigment distribution at the microscopic level in two races of the Wrentit (*Chamaea fasciata*). These races represent extremes in coloration from darker birds along the humid coast of northern California to lighter birds interiorward in more arid situations. A simple statistical analysis has been carried out by measuring clumps of pigment in breast feathers and comparing these dimensions with those of the barbules in which the pigment is contained, thus arriving at a figure representing the percent of pigment per unit of barbule length. It has been shown that there is considerable difference in the amount of pigment that can be measured in this way between birds at the extremes of the color gradient. Since this difference appears to be quantitative rather than qualitative, it has been postulated that such variations could be controlled by just a few hereditary factors and that thus the considerable color differences that are observed in the breast plumage of these birds may be produced by a relatively simple genotypic variation.

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*Museum of Vertebrate Zoology, University of California, Berkeley, California, August 20, 1958.*

## NESTING OF THE BLUE GROSBEAK IN COLORADO

By ROBERT M. STABLER

Whereas the Blue Grosbeak (*Guiraca caerulea*) is not a rare bird in Colorado, details of its nesting here have never been reported. Cooke (State Agric. Coll., Ft. Collins, Colo., Bull. 37, 1897:1-143, Bull. 44, 1898:145-176) was the first to record breeding in the state, with four nests being taken by a Mr. P. L. Jones, in Beulah, Pueblo County, in 1897. No details were given. Smith (Auk, 25, 1908:184-191) found a brood of young in Yuma County in June, 1905, and Lowe (Auk, 34, 1917:453-455) reported that it "nests regularly in the St. Charles Cañon." This last locality is on the St. Charles River, as is Beulah, the site of Jones' nests, and may even refer to the same location. A Mr. Cal Royall also discovered a nest near Sedalia, Douglas County, in August, 1957.

It was the writer's good fortune to observe two successive nestings by the same pair of adults on his ranch some three miles north of Colorado Springs, El Paso County. These two together with the five mentioned above are the only nests of the species known to the author from Colorado.

## ACKNOWLEDGMENTS

Special thanks are due to Dr. Alfred M. Bailey and Mr. Robert J. Niedrach of the Denver Museum of Natural History for their many suggestions; to Dr. Bailey's daughter, Patricia Bailey Witherspoon, who took the photograph used in figure 1; and to Dr. C. W. T. Penland of Colorado College, who kindly identified the associated plants.

## OBSERVATIONS

The nestings occurred in an area about 200 yards north of an arroyo containing a flowing stream and adjacent to a dusty road heavily used by gravel trucks. The vegetation was composed mainly of skunkbush (*Rhus trilobata*), wolfberry (*Symphoricarpos occidentalis*), goldweed (*Verbesina encelioides*), Kansas sunflower (*Helianthus annuus*), horseweed (*Iva xanthifolia*), and tall tansy aster (*Aster bigelovii*). The sites of the two nests were 58 feet apart. Other birds known to nest in the same plot are Sage Thrasher (*Oreoscoptes montanus*), Lark Sparrow (*Chondestes grammacus*), and Brewer's Blackbird (*Euphagus cyanocephala*). A pair of Brewer's Blackbirds nested only 10 feet from, and concurrently with, the first nesting of the grosbeaks.

*Data from nest one.*—The nest was discovered at 6:30 in the evening on June 8. It was about 30 inches above the ground and was securely fastened to both *Rhus* and *Symphoricarpos*. The nest contained one freshly laid egg. Daily observations between 2:00 and 2:30 p.m. revealed that one pale blue, unspotted egg had been added on each of the three days following discovery, the clutch being completed on June 11. The female was flushed from the nest during each of the above four checks.

On June 22 the first egg hatched, another pipped, and two remained unchanged. The following day, by 10:00 a.m. a second egg had hatched and two were pipped, and by 7:30 p.m. three young were hatched. The fourth egg, although pipped, failed to hatch, the chick dying. Daily inspection showed the young still in the nest on June 30. At 2:00 p.m. on July 1 binocular check revealed one bird in the nest, one on a twig some two feet away, and the third could not be found. All of the young birds were gone the following day by 8:00 a.m.

From the above, it may be seen that the female laid one egg per day for four days; that from clutch completion to presumed hatching time of the last egg was 12 days;

that at least two days were required to complete hatching; and that the nestling period was about nine days.

The nest was eventually examined and found to have an inside diameter of 2.5 inches and a cup depth of 2.0 inches. It was quite substantially built of small twigs, rootlets, and strippings of bark. Several lengths of hemp string were included. Near the periphery there was some newspaper, numerous pieces of cellophane, and several large dried leaves. The cup was lined with very fine rootlets, tendrils, and both black and white horse mane or tail hairs.



Fig. 1. Incubating female Blue Grosbeak on first of two successive nests near Colorado Springs, Colorado. Photograph by Patricia Bailey Witherspoon, June 20, 1958.

*Data from nest two.*—The second nest was discovered at 7:00 p.m. on July 17. At this time it contained four eggs similar to the first four. The nest was 38 inches above the ground and was in a rather sparse clump of *Rhus trilobata*. The routine check at 2:00 p.m. on July 23 revealed one damp, newly emerged chick, one pipped egg, and two eggs intact. The following day by 10:30 a.m. two eggs had hatched and two remained unchanged, and by 4:15 p.m. one of the latter eggs showed a slight pipping. At 10:30 a.m. on July 25 three young had hatched, the fourth egg again failing to hatch. As in the first set, examination showed the last chick had died just prior to emergence, although this one did not pip the shell. Using the first nest's incubation data and the second nest's hatching times, we may assume that the female finished her second clutch on approximately July 12, just about one month from the time she finished laying her first set.

Binocular check of the nest at 11:00 a.m. on August 1 showed all three young present. At 8:30 a.m. on August 3 all of the young had left the nest and inspection of the site indicated that the nest had been vacated the day before, on August 2. No young could be seen in the vicinity of the nest. Duration of occupancy by the second brood was, therefore, nine to ten days.

A study of the second nest showed it to be somewhat less well constructed than the first since the eggs could be seen through the upper part of the wall. The inside dimensions were approximately the same as those of nest one and both cellophane and newspaper had again been woven among the twigs and bark strippings. Numerous small pieces of cardboard, not found in the first nest, had also been used here. Rootlets and horse hairs again lined the cup. Pieces of shed snake skin are said to be a quite common feature of this grosbeak's nests. No such material appeared in the present nests, although several species are known to frequent the area.

An interesting feature of the two nests is the fact that when they were removed for final study each gave rise to a series of dipterous maggots. Dr. C. W. Sabrosky (United States National Museum) and Dr. M. T. James (Washington State College) have identified them as *Protocalliphora metallica*, which has not been recorded previously associated with this bird. At no time were maggots observed in the ears, eyes, or nares of the young grosbeaks.

The six young birds were banded, this being the first Colorado banding of the species.

*Colorado College, Colorado Springs, Colorado, August 5, 1958.*

## THE STATUS OF RALLUS ELEGANS TENUIROSTRIS IN MEXICO

By DWAIN W. WARNER and ROBERT W. DICKERMAN

Except for brief mention of occurrence in the states of México and Tlaxcala and the Federal District and of measurements of a small series of specimens collected a half century or more ago, no additional information has been published on *Rallus elegans tenuirostris*. This subspecies was described by Ridgway (1874) as *Rallus elegans* var. *tenuirostris* from "City of Mexico." Oberholser (1937) in his revision of the Clapper Rails (*R. longirostris*) discussed a series of rails taken by E. W. Nelson and E. A. Goldman in July, 1904, near the headwaters of the Río Lerma, referring to them as *Rallus longirostris tenuirostris*. Other, more recent major works have referred to the race of large rails inhabiting the fresh water marshes of the plateau of México, two citing *elegans* and two citing *longirostris* as the species to which this population belongs.

In conjunction with other studies in the marshes of central México, Dickerman collected fifteen specimens of this form between July, 1956, and May, 1958. These, plus two recently taken specimens from San Luis Potosí, extend greatly the known range of *tenuirostris* and add to the knowledge of its biology. All available material of *tenuirostris* was obtained on loan, as well as sufficient material of *R. longirostris*, including all specimens available from the east coast of México, to give us a better picture of the large *Rallus* complex in México. Sixteen specimens from various populations of both "species" in the United States were also at hand for comparisons.

We wish to acknowledge loan of specimens from the following institutions: Chicago Natural History Museum; Museum of Comparative Zoology, Harvard University; Museum of Zoology, University of Michigan; University of California, Los Angeles; Museum of Natural History, University of Kansas; United States National Museum; Peabody Museum of Natural History, Yale University; and the Museum of Zoology, Louisiana State University. We are particularly grateful to George H. Lowery of the Louisiana State University for the loan of two specimens from San Luis Potosí and for permission to include the specimens in this report.

The known geographic range of *tenuirostris* now includes the states of Jalisco, Michoacán, Guanajuato, San Luis Potosí, México, Tlaxcala, and the Federal District. Among the 34 specimens examined there are no apparent differences which suggest geographic variability within this prescribed range. Fading, wear, "foxing," and slight individual variation account satisfactorily for all differences noted between individual birds and between differently dated collections. Localities of occurrence and specimens examined are as follows:

*Jalisco*: 2 mi. N.E. of Verdía (= ca. 10 km. S.S.E. of Zacualco), 3 ad. ♂♂, 1 nat. ♂.

*Michoacán*: Tzintzuntzan (S. shore of Lake Pátzcuaro), 1 ad. ♂; 3 mi. S.W. of Briseñas (near La Barca, E. end of Lake Chapala), 1 ad. ♀; Zacapu, 2 ad. ♂♂; 7 mi. N. of Panindicuaro (= ca. 18 km. N. of Zacapu), 1 ad. ♀; E. end of Lake Cuitzeo (= .5 mi. W. of Araró), 1 ad. ♂, 1 juv. ♂, 1 juv. ♀, 1 unsexed juv.; 1 mi. S. of Maravatío, 1 ad. ♀.

*Guanajuato*: Yuriria, 1 ad. ♂; 1 sight record 2 mi. E. of Salvatierra (Dickerman).

*San Luis Potosí*: Laguna de las Media Luna, 1 ad. ♀; Laguna de las Rusias, 1 juv. ♀.

*México*: Lerma, 5 ad. ♂♂, 1 juv. ♂, 1 nat. ♂, 5 ad. ♀♀, 3 juv. ♀♀; "San Mateo" (exact locality unknown), 3 ad. ♂♂, 1 ad. ♀; several heard at marshes ca. 13 mi. E. of Villa Victoria junction on Toluca-Zitácuaro highway (Dickerman).

*Tlaxcala*: Laguna del Rosario (Ridgway and Friedmann, 1941).

*Federal District*: City of México; Valley of México (part in State of México), (Ridgway and Friedmann, *op. cit.*).

Two specimens from Guanajuato in the Moore Collections at Occidental College

have been referred to the subspecies *R. e. elegans* by Friedmann, Griscom, and Moore (1950), but it is our opinion that these should be re-examined. A record of occurrence of this species at Tlacotalpam, Veracruz, has been listed by several authors, but we have not seen any specimens from that state.

King Rails were encountered at almost every extensive marsh which was visited by Dickerman on the southern part of the central plateau west of México City. In the early morning or late evening during spring and summer, one cannot fail to hear these noisy birds; and they respond to loud noises as do other rails. The edges of many of these marshes have been grazed to a considerable distance into the water; here and among the shorter rushes, water hyacinth, and open cattails these rails were sometimes seen feeding. He has seen as many as four adult rails at once in this situation. When these rails are frightened, they seek the cover of dense vegetation much of which consists of cattails growing to a height of 12 to 14 feet.

The nesting season, as indicated by the assembled specimens, begins in May and continues into July. Testis measurements on eight adult males show a maximum size of  $27 \times 10$  mm. on May 15, while males collected in August show marked regression in testis size. Several from the latter month had testes as small as a November bird ( $9 \times 7$  mm.). Two females taken in May were not yet ready to lay while a female taken on August 31 was past breeding. Nearly fully grown young in juvenal plumage have been collected as early as July 7, while another about one week old was collected on July 22.

Four adult males weighed 271, 306, 317, and 331 grams. Three adult females weighed 220, 255, and 268 grams; a very fat female in early postjuvinal molt weighed 238 grams on November 19. The two heaviest females had "moderate fat" and "very heavy fat" and were in heavy and moderate molt on May 15 and 24. None of the males (May, August and November) had more than "little fat."

The 34 specimens which we have examined of the race *tenuirostris* are here included as a subspecies of *Rallus elegans* because of their close resemblance to *R. elegans elegans*, the only obvious differences being the paler, less boldly barred, flanks and generally paler dorsal and ventral hue of *tenuirostris*. Obviously, our specific assignment is an arbitrary decision, but inclusion of *tenuirostris* in *Rallus longirostris* obscures obvious similarities to *R. e. elegans*. The same, of course, might be said of *R. l. beldingi*, and perhaps of the other populations of large rails of northwestern México and southwestern United States. Hellmayr and Conover (1942) did place all of these in *R. elegans*. Detailed comparative studies of both "species" in the zones of range overlap, as well as of isolated populations, are essential to resolve this problem.

*Rallus longirostris* from Yucatán and Quintana Roo do not bear close color resemblance to *R. elegans* of the highlands of México and eastern North America. We have compared seven specimens of *R. l. pallidus* (including the type) with the unique type of *R. l. grossi* and concur on the validity of these subspecies. Three males and one female from Progreso, Yucatán, taken in May, 1938, are even paler, more silvery dorsally, than is the type of *pallidus*, and this increases the degree of difference between *pallidus* and *grossi* as described. An unsexed specimen (collected by Gaumer; in University of Kansas collections) from Cozumel (Island) and a male from Vigia Chico, Quintana Roo (March, 1949), also are closest to *pallidus* in color, although the latter specimen is very small.

Although Oberholser (1937) and Ridgway and Friedmann (*op. cit.*) have described color phases of the race *tenuirostris*, we have failed to see any evidence of color phases among the adult specimens which we have examined. Variation is most obvious between



Table 1

Measurements of Specimens of *Rallus elegans tenuirostris* and *R. longirostris pallidus*

Name	Sex	Number	Wing	Number	Culmen	Number	Tarsus
<i>tenuirostris</i>	♂ ♂	16	149-162 (154.6)	15	59-65.5 (61.8)	16	55-62 (56.2)
	♀ ♀	11	137-143 (141)	10	53.5-60 (56.7)	11	45-53 (49.8)
<i>pallidus</i>	♂ ♂	3	145-152 (148)	3	53.5-54.5 (53.8)	3	54.5-56 (55)
	♀ ♀	2	138, 141	2	51.5, 52	2	48.5, 49
Vigia Chico, Q.R.	♂		137		50		42
Cozumel							
	(not sexed)		152		57.8		55.5

fresh plumages and worn and faded plumages; differences in preparation of specimens have left exposed different amounts of various groups of feathers. Also, specimens collected about 50 years ago show some "foxing," especially in the light edges of the dorsal feathers. We cannot distinguish color phases either in a series of 15 *R. l. rhyzophorae* as reported by Oberholser (*op. cit.*:343).

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## FROM FIELD AND STUDY

**Sympatry of the Jays *Cissilopha beecheii* and *C. san-blasiana* in Nayarit.**—Despite their considerable morphologic differences, it has been suggested (Hellmayr, Cat. Birds Amer., pt. 7, 1934:37, footnote) that the jays of the genus *Cissilopha* are conspecific. This suggestion has been supported by Sutton (Mexican Birds, 1951:233) and Paynter (Peabody Mus. Nat. Hist. Bull. 9, 1955:217). However, Moore (in Check-list Birds Mex., pt. 2, 1957:119, footnote) recently reported non-intergrading specimens of the two western Mexican species, *C. san-blasiana* and *C. beecheii*, taken only 25 miles apart near San Blas, and he maintained, on the basis of this evidence, that they are specifically distinct. Specimens and observations obtained by us in June, 1958, strengthen Moore's contention.

The larger of the two species, *C. beecheii*, has a range extending from the Alamos Faunal District of Sonora south along the Pacific coastal plain of México to Nayarit. The southernmost record is San Blas, reported in 1876 by Sclater and Salvin (Proc. Zool. Soc. Lond., 1876:270); but, presumably because McLellan (Proc. Calif. Acad. Sci., ser. 4, 16, 1927:51) collected only *C. san-blasiana* at San Blas, Hellmayr (*op. cit.*: 39), footnote) claimed that the early record did not apply to the city of that name in Nayarit. *Cissilopha san-blasiana* was reported from San Blas in the 1840's and was found there also by McLellan; there are no reports of its regular occurrence farther north.

On June 21, 1958, we heard three *C. beecheii* calling from a stand of mangroves bordering a narrow estuary one mile south-southwest of the plaza in San Blas. One specimen, an adult male, was taken, after which the others moved off in the mangroves and refused to respond to squeaks or imitations of their calls. The next day an adult female with a brood patch was collected in a similar situation one-half mile northeast of San Blas. This individual and a lone juvenile were engaged in a vigorous dispute with a Pale-billed Woodpecker (*Phloeoceastes guatemalensis*). We did not encounter *C. beecheii* again although we hunted along mangrove-bordered estuaries and in other coastal vegetation types. That it is decidedly uncommon at San Blas is further indicated by the fact that most local fishermen and boatmen were completely unfamiliar with it.

We did not find *C. san-blasiana* in the immediate vicinity of San Blas, but it was present in moderate numbers in mixed deciduous-evergreen thickets bordering palm groves and cleared fields and in wooded draws five miles east of town along the road leading from San Blas to the Tepic-Mazatlán highway. Similarly, McLellan (*op. cit.*: 51) noted that "only a few . . . jays were seen about San Blas, and they occupied the higher ground in the vicinity of the Tepic road." These jays stayed well down in dense cover but were easily attracted by owl calls or squeaks. Three specimens collected are typical representatives of the northern race *C. s. nelsoni*, showing no approach to *C. beecheii*. Nor do our specimens of the latter approach *C. san-blasiana* in any way.

Although *C. beecheii* and *C. san-blasiana* have yet to be taken in the same stand of vegetation, their occurrence five miles apart provides clear evidence that they are species. Contact between the two jays at San Blas is limited by low, densely forested hills that lie east of town between the estuary mangrove habitat of *C. beecheii* and the slightly more arid inland situations frequented by *C. san-blasiana*. But undoubtedly the two habitat types are adjacent and the jays in close contact north and south of the hills, which extend only a few miles.

The strict habitat segregation of these jays where they are sympatric is noteworthy. In Sinaloa and Sonora, *C. beecheii* ranges inland to at least 1500 feet elevation (Moore, *op. cit.*: 120), and at Pie de la Cuesta, Guerrero, *C. san-blasiana* occurs in mangroves as well as in vegetation of the type in which it is found at San Blas.

The common flock calls of the two jays are decidedly different. That of *C. san-blasiana* is a series of short, monotone *chat* or *cha* notes; that of *C. beecheii* is more complex and involves changes in pitch.

The two currently recognized subspecies of *C. san-blasiana* apparently differ only in color. Ridgway's claim (Bull. U. S. Nat. Mus., 50, pt. 3, 1904:314) that the tail is "decidedly longer" in the southern race (*C. s. san-blasiana*) requires confirmation. Tail measurements of our adult male and female *C. s. nelsoni* from San Blas are 154 and 153 mm., respectively, and Ridgway gives an average of 153 mm. for three male specimens of the southern race from Guerrero.—ROBERT K. SELANDER and DONALD R. GILLER, Department of Zoology, University of Texas, Austin, Texas, July 23, 1958.

**Method of Head Scratching in the Wrentit and Other Species.**—The Wrentit (*Chamaea fasciata*) has been classified variously by ornithologists and has sometimes been regarded as constituting the only family of birds unique to North America. The species has been placed in such different groups as the "Toxostominae," Troglodytidae, Paridae, and "Timeliidae" by various older authors; it has been treated as a monotypic family standing next to the "Mniotiltidae" or Sylviidae by others (Lucas, Proc. U. S. Nat. Mus., 13, 1890:343). More recent treatments have retained it as a monotypic family or have combined it with the Paradoxornithidae or Timaliidae.

Simmons (Ibis, 99, 1957:178-181) has reviewed the taxonomic importance of head scratching in passerine birds. From observations on 79 species of 25 passerine families, he concluded that only the Timaliidae (11 species observed) scratch their heads "directly" (with the leg under the wing rather than over it). In view of the suggested relationship of the Wrentit with the Timaliidae, it seemed desirable to ascertain the method of head scratching which it uses. Field observation during a summer in the habitat of the Wrentit failed to provide the information because of the reluctance of the species to perch in the open. However, in January, 1958, I had the good fortune to obtain a live Wrentit, for which I wish to thank John Ralph. This bird has been observed to scratch directly 20 times; these observations were made mostly by myself but also by W. J. Hamilton, III, and W. Z. Lidicker. At no time was the bird seen to scratch indirectly. These observations tend to support the claim of some earlier authors that *Chamaea* has close affinities with the Timaliidae.

The reliability of this behavioral character for classification depends upon its consistency in phylogenetically natural groups and upon the number of species for which the method of head scratching has been ascertained. The consistency in natural groups appears to be high, although the Ovenbird (*Seiurus aurocapillus*), because of its direct method of scratching (Nice, Trans. Linn. Soc. N. Y., 6, 1943:45; Ficken and Ficken, Ibis, 100, 1958:277-278), constitutes an exception among passerines not closely related to the Timaliidae. The Northern Waterthrush (*S. noveboracensis*), the Louisiana Waterthrush (*S. motacilla*), the Blue Jay (*Cyanocitta cristata*), and "several European passerines" have been reported to scratch the head directly as nestlings sometimes but not as adults (Ficken and Ficken, *op. cit.*). I detected no such irregularities in nine closely watched, hand-raised Steller's and Scrub jays (*Cyanocitta stelleri* and *Aphelocoma coerulescens*). In addition to the species of passerines reported on by Simmons, Miller (Univ. Calif. Publ. Zool., 38, 1931:220) mentioned one, Nice (*op. cit.*) mentioned three, Haverschmidt (Ibis, 99, 1957:688) added three, Meyerriecks (Bull. Mass. Aud. Soc., 42, 1958:129) added one, Ficken and Ficken (*op. cit.*) added 36, Andrew (Brit. Jour. Anim. Behav., 4, 1956:85) added four, and Hailman (Bird-Banding, 29, 1958:242) added one. In this paper 18 species are added to make a total of 147 species in 29 families of passerines for which the method of head scratching is known to me. There may be records for additional species in the writings of the Heinroths.

I have observed the following species scratching indirectly, with the leg over the wing (number of critical observations in parentheses): *Empidonax difficilis* (fide John Davis), *Cyanocitta stelleri* (many), *Aphelocoma coerulescens* (hundreds), *A. ultramarina* (many), *Pica nuttalli* (1), *Corvus brachyrhynchos* (2), *Psaltiriparus minimus* (9), *Thryomanes bewickii* (4), *Dendroica townsendi* (1), *Wilsonia pusilla* (2), *Euphagus cyanocephalus* (1), *Carpodacus cassinii*, male (2), *Pheucticus melanocephalus* (1), *Spinus psaltria*, 13- and 15-day old nestlings (many), adult (1), *S. lawrencei* (1), *Geospiza* sp. (several), *Pipilo fuscus* (3), *Spizella breweri* (1), and *Zonotrichia atricapilla* (1).—JERRAM L. BROWN, Museum of Vertebrate Zoology, University of California, Berkeley, California, March 22, 1958.

**New Bird Records from Southeastern Oregon.**—The birds listed here have been observed in the course of field work, conducted since the fall of 1955, on and near the Malheur National Wildlife Refuge, Harney County, Oregon. Except for the goose observations, all of the records have been made on the Malheur Refuge, the northern end of which lies about 25 miles south of the town of Burns. The refuge, which is about 4100 feet in elevation, extends south for 40 miles to the vicinity of the town of Frenchglen.

Except where otherwise noted, these records supplement Gabrielson and Jewett's Birds of Oregon (1940).

*Podiceps auritus*. Horned Grebe. On June 24, 1958, Willis Keithley, Dale Hein, and the writer

observed three of this species along Rockford Lane in the Blitzen Valley. Later the same day Keithley found the nest and eggs of this species in the same area. Keithley, Richard Pfeifer, and the writer obtained excellent photographs of the female on the nest. Some of these pictures are in the refuge files. No attempt was made to collect specimens, as it is hoped that this bird may become a permanent breeding species on the Malheur Refuge. As far as can be determined, these are the first summer and breeding records for this species in Oregon.

*Leucophoyx thula*. Snowy Egret. Gabrielson and Jewett state that this species formerly bred in Oregon on the Lower Sylvies River near Malheur Lake. Snowy Egrets have been nesting in recent years on Malheur Lake. In 1957 it was estimated that there were 100 nests in a single colony on the lake. Similar numbers have been recorded for the past 10 years.

*Chen caerulescens*. Blue Goose. On March 22, 1956, Dr. Charles G. Hansen and the writer spotted an adult Blue Goose in a flock made up of about 5000 Snow Geese (*Chen hyperborea*) and 200 Ross' Geese (*Chen rossii*) resting on a flooded meadow about one mile east of Hines, a town which adjoins Burns. The Blue Goose was observed for a considerable length of time through a 16 power telescope at a distance estimated at 400 feet. Its pinkish legs, brownish gray body, and contrasting white head and neck showed up distinctly. Harney County serves as a major stopping-off place for Snow and Ross' geese returning from their California wintering grounds to Arctic nesting areas. There are several published records of the Blue Goose in California (Grinnell and Miller, Pac. Coast Avif. No. 27, 1944) and additional unpublished instances of its occurrence which came to the writer's attention during two years spent on waterfowl refuges in California. The Blue Geese usually accompany the similar appearing Snow Geese and breed in some of the same areas. It is thus not surprising that this species should be recorded in Oregon.

*Chen rossii*. Ross' Goose. Gabrielson and Jewett list this bird as a rare straggler in Oregon and for Harney County they list a specimen taken by Bendire. As elsewhere in the Pacific Flyway, the Ross' Goose is more abundant than was previously supposed. On the basis of observations made during the springs of 1956 and 1957, the area in the vicinity of Burns is a concentration point for this species on its spring migration. In addition to the observation listed under the Blue Goose, flocks of Ross' Geese numbering from 50 to 200 were seen on March 20 and March 28, 1956, in this area. Only a very small segment of the total population of white geese in the area was checked. In this same period various sightings were made of some of the 53 Ross' Geese which had been dyed yellow the previous fall in the Klamath Basin to trace migration routes. Ross' Goose flocks were also seen in the spring of 1957. One or more Ross' Geese are confiscated almost every fall from hunters on the Malheur Refuge public hunting area.

*Spatula clypeata*. Shoveler. Gabrielson and Jewett list this species as a summer resident in eastern Oregon. It was seen a number of times in the winter of 1957-58. As late as December 18, it was estimated that there were from 10,000 to 25,000 present on Harney Lake. In addition six were observed at the Double-O Unit on January 10 and one individual was noted at Boca Lake on January 17.

*Bucephala albeola*. Bufflehead. Four to five individuals were seen on May 28, and July 31, 1957, on Boca Lake. It is noted that Evenden (Condor, 49, 1947:169) found this species with young in Linn County. These are the only summer records of the Bufflehead in Oregon that have come to my attention.

*Clangula hyemalis*. Oldsquaw. An immature male of this species was collected at refuge headquarters on November 17, 1956, and subsequently deposited in the United States Fish and Wildlife Service collection at the National Museum. The bird was seen several days prior to the collecting date. An immature specimen collected on Malheur Lake about November 9, 1958, was received through Lloyd Smith of the Oregon State Game Commission. A third specimen was found dead near refuge headquarters on December 8, 1958. A sight record for the Oldsquaw was made on the Malheur Refuge on January 28, 1954, by Dr. Ray C. Erickson. Although the literature contains inland records of this species in surrounding areas, I have been unable to locate any published occurrences of this bird in eastern Oregon.

*Squatarola squatarola*. Black-bellied Plover. Fifteen were seen on October 2, 1957, on the east side of Malheur Lake and six were seen on October 18, 1957, at the Double-O Unit. On September 21, 1957, on the east side of Malheur Lake one was picked up sick, presumably with botulism. This bird later died. On May 14, 1958, four were seen on Harvey Lake. This species has been on the refuge

bird-list for some time, but it is noted Gabrielson and Jewett do not list any eastern Oregon records for it nor can I find any records for this part of Oregon in other ornithological literature.

*Limosa fedoa*. Marbled Godwit. Although Gabrielson and Jewett indicate this bird as a "very rare transient" in Oregon, the occurrences below tend to indicate otherwise. On September 23, 1957, a sick individual was picked up on the east side of Malheur Lake, held for several days, and then released at the same location after recovery. Since I had observed godwits many times in the course of several years spent on the Stillwater Marsh in western Nevada, several hundred miles to the south, little thought was given to the matter of this species being considered a rarity in Oregon until the literature was checked. Recent sight records for this bird include one at the Double-O Unit on June 7 and September 13, 1956; 10 on August 7, 1957; 50 on August 31, 1957, on the east side of Malheur Lake and about 10 at the same location on October 2, 1957. United States Fish and Wildlife Service records list August and September occurrences of this species at Malheur since 1935. Two were banded in August of 1941.

*Iridoprocne bicolor*. Tree Swallow. On January 9, 1958, while at the Sod House Spring at refuge headquarters, I caught a glimpse of what appeared to be a swallow darting behind an obstruction. Thinking the bird must surely have been something else, the matter was disregarded. The following morning a Tree Swallow was collected at this spring, which forms a pond nearly an acre in extent that remains free of ice the year round. The bird proved to be a male in very poor condition. It was put up as a study skin which has been sent to the United States Fish and Wildlife Service collection at the National Museum. It scarcely seems possible that this bird could have subsisted in this area through the winter. One would surmise that it moved in. Many days the temperature did not go above freezing and insect activity was certainly negligible. The minimum temperature the day this bird was first seen was 9°F., and the maximum 45°F. Even for western Oregon, which has a mild climate compared to eastern Oregon, I have found no published records for this species in January. Gabrielson and Jewett list their earliest arrival date for Oregon as February 22 and latest date for departure as September 24. The Tree Swallow normally arrives at the Malheur Refuge in late March.

*Sitta pygmaea*. Pigmy Nuthatch. One of this species was found dead at refuge headquarters by Dr. Charles G. Hansen on September 5, 1955, and was mounted for use in the refuge museum. So far as I can determine, this species has not been previously listed for Harney County, although it has previously been listed for timbered areas located in surrounding counties.

*Toxostoma rufum*. Brown Thrasher. An individual of this species was taken at refuge headquarters on March 7, 1954, by Mr. J. C. Scharff in a quail trap used for transplanting purposes. This specimen is presently located in the refuge museum. A sight record for the Brown Thrasher at Upper Klamath Lake was made by Aaron C. Bagg on August 20, 1940 (Auk, 58, 1941:99-100). No other records of the Brown Thrasher for the state have come to our attention.

*Phainopepla nitens*. Phainopepla. On May 17, 1957, Dr. J. Milford Anholm, a Corvallis dentist, informed me that he and his wife saw a male Phainopepla at the Witzel Patrol Station located about 10 miles north of Frenchglen. Dr. Anholm suggested the bird might remain and on the following morning he and the writer sighted the bird nervously moving through the trees at the aforementioned sight. Upon collection, the bird proved to be in excellent plumage and had been eating the berries of Russian olive (*Elaeagnus angustifolia*). The skin has been sent to the United States Fish and Wildlife Service collection at the National Museum. As far as I can determine, this species has not been recorded previously in Oregon.

*Dendroica caerulescens*. Black-throated Blue Warbler. On October 9, 1957, a male of this species in breeding plumage was collected at refuge headquarters. The bird was with a flock of Audubon's Warblers (*Dendroica auduboni*) which was working the trees and shrubs about the refuge buildings. The specimen was sent to the National Museum. The only other west coast records of this species appear to be three occurrences in California (Abbot, Condor, 51, 1949:98-99; Kensey, Condor, 56, 1954:311; and Grinnell and Miller, Pac. Coast Avif., No. 27, 1944:401).

*Zonotrichia querula* and *Zonotrichia albicollis*. Harris' Sparrow and White-throated Sparrow. Single individuals of these two species appeared on October 30 and 31, 1955, before the photographic blind of Mr. John Cowles, who had baited an area to attract White-crowned Sparrows (*Zonotrichia leucophrys*) for photographic purposes at refuge headquarters. Excellent photographs were obtained of both of these unusual birds, copies of which are in both the refuge's and writer's slide files. The

Harris' Sparrow apparently has not been previously recorded in eastern Oregon and the White-throated Sparrow is, according to Gabrielson and Jewett, considered a rare straggler in Oregon for which there are no previous records for Harney County.—DAVID B. MARSHALL, *United States Fish and Wildlife Service, Burns, Oregon, December 10, 1958.*

**Unusual Nesting Observations in Colorado.**—Some unusual nestings observed in the San Luis Valley of south-central Colorado seem worthy of note.

On May 5, 1954, slightly southwest of the village of Mosca, Alamosa County, Colorado, a nest of a Swainson's Hawk (*Buteo swainsoni*) was observed about 12 feet up in a lone cottonwood tree (*Populus* sp.). The tree containing the nest stood exposed in the middle of an open field of sagebrush. One of the hawks flushed upon our approach and in doing so one egg fell from the nest. The egg was fresh and it was found that the nest contained one other egg. While I was preparing to climb to the nest for closer observation, a Black-billed Magpie (*Pica pica*) flew from the bottom of the debris assumed to be the hawk's nest. Investigation revealed that the magpie was incubating six eggs and that the hawk had deposited its eggs in a slight depression, lined with grass, on top of the domed roof of the magpie nest. This was the first and only time that such an association was observed between these two species.

On the same date, May 5, 1954, a few miles north of the location just described, another Swainson's Hawk nest was examined in a grove of cottonwoods at the edge of an irrigated hay field. The nest contained two eggs in a crotch about 20 feet from the ground. The nest was large and bulky and three pairs of House Sparrows (*Passer domesticus*) had built nests in the lower part of the hawk nest. Two sparrow nests contained full clutches of five and six eggs, respectively, and the third had two eggs. An harmonious relationship seemed to exist between the hawks and the House Sparrows which seemed rather surprising in view of the normal pugnacity of the latter.

This same nest was used by a pair of Swainson's Hawks in May, 1957; no House Sparrow nests were noted at that time. Also a nest of Long-eared Owls (*Asio otus*) was found in an adjacent tree less than 40 feet away. These unusual nestings, in such close proximity to one another, may have resulted from lack of suitable nesting sites for the birds since the San Luis Valley is devoid of wooded areas other than some trees around ranch houses and in river bottom groves. These areas are not chosen by Swainson's Hawks if a more exposed location is available. Similar nestings in adjoining trees have been observed in the Red-tailed Hawk (*Buteo jamaicensis*) and the Great Horned Owl (*Bubo virginianus*). In neither instance was any territoriality displayed. At the site of the Swainson's Hawk and Long-eared Owl nests, no apparent antagonism was evident in birds of either species since the owls often roosted in the tree containing the brooding hawk and the hawks in turn regularly perched on a main fork of the tree some 10 feet above the owl nest when approaching their own nest site.

On May 13, 1954, at Adam's Lake, Alamosa County, Colorado, a female Marsh Hawk (*Circus cyaneus*) was flushed from a nest of six eggs located among heavy tule at the lake edge. Upon approaching the hawk nest, a female Mallard (*Anas platyrhynchos*) flushed from a nest containing seven eggs located only 12 feet from the hawk nest. At first appearance it seemed as if both birds had flown from the same nest. Both the hawk and the Mallard circled overhead while the nests were examined. Marsh Hawks and Mallards are both common breeders at the lake but no nests so close together have been observed before.

On April 25, 1954, near the village of San Acacio, Costilla County, Colorado, a Great Horned Owl was flushed from a rocky prominence. A nest containing four eggs was found in a small eroded pocket of the gently sloping rock less than six feet from the ground. Thirteen nests of this same species observed that season in the same general area were all located in cottonwood trees (one exception was a nest placed on the ceiling rafters of a barn) and none was so close to the ground or on rocky cliffs. The number of eggs exceeded the usual clutch size which is normally two and more rarely three. The eggs were removed and all were found to contain large embryos which had died sometime during the second and third week of development. The shells were very glossy and polished from long incubation and were less granular than normal shells of this bird. Most owls of this species begin laying about the third week in February in south-central Colorado. Thus the eggs taken may have been incubated for over two months. Strong parental attachment is indicated since the normal term of incubation is 28 days. Two of the eggs each had small holes in them. The cause of these holes could not be determined.

On May 4, 1954, near the town of Blanca, Costilla County, Colorado, a female Say's Phoebe (*Sayornis saya*) was found dead on her nest. The nest was under the eaves of a shed and had been under observation since nest construction began. The bird had laid three eggs and dissection revealed a well-formed egg in the lower oviduct ready to be laid. Cause of death could not be determined because of the decomposed condition of the specimen, but speculation indicated that the bird may have died due to insecticidal toxicants used on ingested insects. Possibly, also, some malfunction occurred which prevented normal passage of the egg.—JOHN H. BRANDT, *Truk, East Caroline Islands, May 11, 1958.*

**Vermilion Flycatchers Nesting in San Diego County, California.**—The A.O.U. Check-list, fifth edition (1957) regards the Vermilion Flycatcher (*Pyrocephalus rubinus*) as wintering "sparingly in California (Santa Barbara, San Diego) . . ." On February 18, 1958, at Santee, San Diego County, California, a female Vermilion Flycatcher was observed starting a nest. Mr. Kerry Muller who has studied birds in this area for several years said that a male Vermilion Flycatcher had been seen for about a year. This nest was completed and the eggs were laid on March 4, 5, and 6, respectively. On March 22 one egg had hatched but on March 23 one egg and the young bird were gone and one egg remained in the nest. The nest was deserted but the same pair built another nest about 50 yards to the west. This nest was also completed and two eggs were laid which disappeared from the nest and the birds again deserted. They returned to the same tree in which they had built their first nest and here were successful in raising a brood of three which left the nest on May 18–19. At this writing the female has another nest with three eggs.

Another male Vermilion Flycatcher had been observed during the winter months on the grounds of the United States Naval Hospital in Balboa Park, San Diego, California. Dr. Leon L. Gardner undertook the observation of this bird. On February 23 he saw a female and on March 22 nest building was observed. On April 6 three eggs were in the nest and on April 24 the young were leaving the nest. This pair is now in the process of raising a second brood. A second male Vermilion Flycatcher was seen in the company of this pair on the hospital grounds but it apparently had no mate.

As far as I am able to ascertain, these are the first nesting records of this species in western California.—JAMES E. CROUCH, *San Diego State College, San Diego, California, June 9, 1958.*

**European Starling Nesting in the San Joaquin Valley, California.**—On May 12, 1958, I found a nest of a European Starling (*Sturnus vulgaris*) in Micke Grove Park, San Joaquin County, approximately four miles due south of Lodi, California. This nest was located in a small live oak (*Quercus wislizenii*) about 17 feet above the ground in a cavity in the tree. The tree is located in a grove of live oaks and white oaks (*Quercus lobata*) which is much used as a picnic area. Both parents were seen making many trips to and from the nest bringing insects to the young, the exact number being unknown as the cavity was too deep to allow the young to be counted. However, from a distance several young birds were seen as they appeared at the nest opening to receive food. Mr. John Roumasset, a warden with the California Department of Fish and Game, and Zerifa Kroll both saw the parents bringing food to the young on May 14. On May 17 the nest was empty and presumably the young had left. This species has been observed in flocks in this immediate area during the winter of 1956–57 and in the past winter, but it is believed that this is the first nesting record in the San Joaquin Valley.—RONALD T. REUTHER, *Micke Grove Zoological Garden, Lodi, California, May 19, 1958.*

**Breeding of the Starling in Southern California.**—Starlings (*Sturnus vulgaris*) were first reported in California in 1942 (Jewett, Condor, 44, 1942:79). Since that date they have been seen in various localities in steadily increasing numbers, but these were usually winter observations. To our knowledge, the records of breeding herein reported are the first for southern California.

On March 28, 1958, Tramontano observed an adult Starling on electrical wires in Artesia, Los Angeles County, California. The heavily traveled street was in a residential area with numerous dairies in the vicinity. A row of palm trees (*Washingtonia filifera*) lined each side of the street. A single adult was observed in the same area on April 5, 17, 29, and May 2, 1958, and a nesting site was discovered



in one of the palms on May 8, 1958. The nest, approximately 35 feet from the ground, was located within hanging dead fronds and thus was only partly visible. Several Rock Doves (*Columba livia*) were nesting in the crown of the same tree. Only one adult Starling was seen. This bird, presumably a female, made repeated trips to and from the nest at approximately five-minute intervals. Food was brought to the young and excrement was removed each round trip. The young could be heard distinctly at each feeding although they were not visible from the ground.

On May 18, 1958, Tramontano discovered two more Starlings seemingly nesting in another palm four-tenths of a mile north of the above site on the same street. One spent considerable time within the fronds while the second sang from nearby electrical wires. On May 20, 1958, another visit was made to this tree by Rainey and Tramontano and again two adults were seen. One flew from the fronds with an object in its bill and dropped it to the ground from an adjacent tree. It proved to be one-half of a whitish-blue egg shell, the color of which compares precisely with eggs of Starlings as illustrated in Butler's British Birds With Their Nests and Eggs (vol. 2, pl. 6). Rock Doves and House Sparrows (*Passer domesticus*) were the only other birds nesting in these palms, and their eggs are readily distinguished from those of Starlings. On the same day, the young at the first nest were observed with the aid of binoculars. Only one young bird could be seen perched on the edge of the nest each time the adult brought food. Its size, approximating that of an adult, indicated that departure from the nest was imminent. In addition, on the same day, still another adult was seen flying into a nearby palm. However, it could not be determined whether there was a third nest in this tree. It was not possible to collect any of these Starlings owing to the residential area in which they were observed.

On May 4, 1958, two of us (Rainey and Van Hoose) obtained a female Starling 5.4 miles east of Holtville, Imperial County, California. This female in the company of another Starling, presumably a male, flew from a woodpecker hole situated 30 feet up in a large cottonwood tree. Repeated efforts to obtain the second bird failed. A study skin of this Starling (LBSC ♀ ad. 2068) was deposited in the Long Beach State College Vertebrate Collections. The female had numerous developing ova; the two largest measured 12 by 10 and 9 by 8 millimeters. Seemingly, egg-laying was imminent or had commenced. There was a well-developed brood patch. The collecting locality was in a small grove of five cottonwoods and six palms (*Washingtonia* sp.) surrounded by irrigated farmland. Other birds observed in the grove were: House Sparrows nesting in the palms, a pair of Bullock's Orioles (*Icterus bullockii*), Western Kingbirds (*Tyrannus verticalis*), a pair of Gila Woodpeckers (*Centurus uropygialis*), Red-winged Blackbirds (*Agelaius phoeniceus*), and Brewer's Blackbirds (*Euphagus cyanocephalus*). Intensive collecting over a three-day period in eastern Imperial County did not reveal additional Starlings.—DENNIS G. RAINEY, S. G. VAN HOOSE, and JOHN TRAMONTANO, Long Beach State College, Long Beach, California, June 20, 1958.

**Four Recent Records from Southeastern New Mexico.**—An Hudsonian Godwit (*Limosa haemastica*) was seen at Bitter Lakes Refuge, near Roswell, New Mexico, from about May 16 to 20, 1958. It was observed by Robert Garrett, Bruce K. Harris, James H. Sikes, and the writer. The bird was distinguished from the Marbled Godwit (*Limosa fedoa*) which is somewhat common here, by the reddish underparts and the white patch at the base of the tail, clearly observable when the bird was in flight. It was quite gentle and fed in shallow water near Dowitchers. Frequently when feeding the entire head was immersed. Apparently no previous record of its occurrence in New Mexico has been published.

The Vermilion Flycatcher (*Pyrocephalus rubinus*) has nested for two and probably three consecutive years at Diamond A ranch, 20 miles west of Roswell, Chaves County, New Mexico. On July 10, 1957, I saw a pair feeding young out of a nest in a hackberry tree. On June 12, 1958, I photographed a pair feeding young out of a nest in a cottonwood about 200 feet from the 1957 nest. Mr. Thompson, the ranch manager, believes the birds were there in the summer of 1956. I have observed the species here with some regularity in spring and fall in recent years. Mr. J. Stokley Ligon of Carlsbad, New Mexico, wrote that no actual nesting record for eastern New Mexico exists although the species is seen at times in the vicinity of Carlsbad during the nesting season. The nesting range has been established in New Mexico as far east as the Rio Grande Valley and north to Socorro. This observation seems to represent an eastward extension of approximately 150 miles.



The Mississippi Kite (*Ictinia mississippiensis*) was seen by three separate observers in Chaves County, New Mexico, on June 26 and 28, 1958. I saw one seven miles northeast of Roswell on June 26; J. J. Harman saw one, probably the same bird, near the same location on June 28; and Sam Tanner saw one, possibly the same bird again, on June 28 about 20 miles north. Scant records available to me indicate that these may be the only reliable observations in New Mexico although Bailey (Birds of New Mexico, 1928:155) mentions the existence of three specimens in the Woodhouse Collection which may have been secured in New Mexico. On July 12, 1958, I counted nine single birds of this species in a distance of about 50 miles on the highway between Shamrock, Texas, and Dill, Oklahoma. The locations referred to are separated by about 300 miles of almost treeless plains.

A new or hitherto unpublished record of the nesting of the Least Tern (*Sterna antillarum*) in New Mexico was secured at Bitter Lakes Refuge, near Roswell, in June, 1958. On June 19 I observed four clutches of eggs on a mud flat and on June 21 I secured pictures of one nest and one nesting bird. Mr. J. Stokley Ligon of Carlsbad, New Mexico, wrote that he had photographed a nesting Least Tern at Bitter Lakes in 1956. He stated further that these are the only known nesting records for New Mexico.—VESTER MONTGOMERY, *Roswell, New Mexico, August 2, 1958.*

**Red-naped Sapsucker in Monterey County, California.**—On May 19, 1958, we observed a male Red-naped Sapsucker (*Sphyrapicus varius nuchalis*) at the Hastings Reservation, Monterey County, California. This locality is two and one-half miles east of Jamesburg and approximately 20 miles east of the Pacific Ocean at Point Sur. The bird was working on the trunks of small fruit trees near a house; it was observed for about seven minutes. On May 20 it was seen again in the same place, and on May 21 it was heard calling several times and seen twice, both times drilling on an elm tree near the house. The trunk of the elm bore fresh perforations, obviously the work of this individual.

The only race with which the identity of this bird might have been confused is typical *varius*, but this form has been recorded in California only once (Davis and Howell, Condor, 53, 1951:102). Further, the nape of the individual which we observed was definitely red. Although *nuchalis* has been recorded a few times in the coastal region of California, these prior records were made in the fall and winter. The occurrence of *nuchalis* at such a late date and so far from its nearest breeding grounds, the White Mountains of extreme central eastern California, is most unusual. Indeed, the latest seasonal record of sapsuckers of the "Red-breasted" type (presumably *S. v. daggetti*), which winter regularly at the Hastings Reservation, in the period from 1937 to 1947 at that locality, was made on April 16, 1940 (Linsdale, Condor, 49, 1947:238).—JOHN DAVIS and BETTY S. DAVIS, *University of California Hastings Reservation, Carmel Valley, California, May 26, 1958.*

**Mockingbird Observed on the Southern Tip of Tiburon Peninsula, Marin County, California.**—On June 1, 1958, while in my garden, I heard the song of a Mockingbird (*Mimus polyglottos*) but could not sight the bird. It was not until June 5 that I finally sighted and definitely identified it as a Mockingbird although its song was heard daily in the early morning and evening hours until June 15 when it apparently left the territory.

Observation was confined to a heavily wooded, five-acre, semi-cultivated garden. The bird seemed to restrict itself to a group of Monterey pines (*Pinus radiata*). It frequently changed perches in a short flight from tree to tree and alighted on branches close to the trunk of the tree which made observation difficult at times. Although the bird was heard every day, it was sighted only occasionally during the two-week period.

The Mockingbird's repertoire consisted of imitating the notes of many of our local (Marin County) birds, both resident and migratory. This bird seemed to be "off base" because all records indicate that Mockingbirds in Marin County, and particularly on the Tiburon Peninsula, are rare. This view is further substantiated because this appeared to be a single individual and the observations were made during the normal breeding season of this species.—RALPH J. A. STERN, *San Francisco, California, July 2, 1958.*

**Occurrence of the Great Blue Heron in Arctic Alaska.**—On June 13, 1958, in Wainwright on the arctic Alaskan coast, I was halted by an old Eskimo, Joe Aveoganna, who asked me whether I would like to see an unusual "duck." He entered his hut and returned carrying a Great Blue Heron

(*Ardea herodias*). He stated that he had shot the bird on June 11, at a lagoon about five miles southwest of Wainwright. The specimen was purchased and prepared as a study skin; it is now deposited at the Museum of Vertebrate Zoology, University of California, Berkeley.

The specimen, which weighed 2064 grams, was a female (largest follicles measuring 2 mm.). The stomach contained 15 balls of hair—one, an inch in diameter, two,  $\frac{1}{2}$  inch in diameter and a dozen small wads about  $\frac{1}{4}$  inch in diameter. When the balls of hair were dried, the reddish color, characteristic of the brown lemming (*Lemmus trimucronatus*), was noticeable. Also in the stomach were the remains of two sets of vertebrae from small fish, probably sticklebacks. A large wad of grass and several chironomid larvae were also found.

According to Dr. Frank A. Pitelka, the specimen represents the northwestern race *A. h. jannini*.

The known breeding grounds of this race extend north to Yakutat Bay. There appear to be no previous records for the species in western or northern Alaska. For the American arctic as a whole, the latest edition of the A.O.U. Check-list of North American Birds mentions only accidental occurrence of the race *A. h. herodias* in Greenland.—ELBERT M. BROCK, *Arctic Research Laboratory, Barrow, Alaska, June 30, 1958.*

**Brewer's Blackbirds in the Sierra Nevada, California.**—On September 13, 1958, I observed a flock of 78 Brewer's Blackbirds (*Euphagus cyanocephalus*) at an elevation of 11,520 feet above Lake Italy in the High Sierra Wilderness Area of the Sierra National Forest, Fresno County, California. This was about 800 feet above timberline. We had had stormy weather the previous week, but that day was comparatively warm and clear. The birds were assumed to be feeding on grasshoppers, as an abundance of the latter had been noted. They came upon us from the direction of Lake Italy and moved on up the basin, which is quite wide and open here, toward "Gabbott Pass" (elevation 12,240 feet).—PHYLLIS LINDLEY, *Berkeley, California, October 1, 1958.*

**Longevity of an Injured Scrub Jay.**—In April, 1950, when we moved into a new home near Monterey, California, we noticed an adult Scrub Jay (*Aphelocoma coerulescens*) with a broken upper mandible. It was broken at the base next to the skull and moved from side to side when the bird attempted to feed. We placed food on a sundeck railing and the bird soon came regularly to feed. Within a few months the upper mandible apparently fused again to the skull, but it remained bent upward and to the left so that the bird could not close the bill. The tips of the upper and lower mandibles remained at least one-half inch apart when the mouth was closed. The bird seemed to live in the immediate vicinity and fed at stations set up by neighbors who knew the bird. When we had no cats, the bird would come when whistled for and would enter the kitchen to feed on table scraps. It also liked dogfood cubes. The jay was last seen in late June, 1958. Jay feathers were found near its feeding site, and we suspect one of our cats captured it. This bird was observed almost continuously for over eight years. Considering the nature of its injury, this is an interesting longevity record.—EUGENE C. HADERLIE and AILEEN E. HADERLIE, *Monterey, California, August 11, 1958.*

## NOTES AND NEWS

The annual meeting of the Cooper Ornithological Society will be held at Berkeley, California, April 3 to 5, 1959, and will be sponsored by the University of California and its Museum of Vertebrate Zoology. Howard L. Cogswell is the chairman of the Local Committee. The first session, devoted to the annual business meeting and the presentation of scientific papers, will be held on April 3rd.

At the 75th anniversary meeting of the American Ornithologists' Union in New York City last October, the following officers were elected: Ernst Mayr, president; George H. Lowery, Jr., 1st vice-president; Dean Amadon, 2nd vice-president; Herbert G. Deignan, secretary; Charles G. Sibley, treasurer; and Eugene Eisenmann, editor of *The Auk*. The following were elected to the class of Fellows: Andrew J. Berger, William Pierce Brodkorb, and Harold F. Mayfield. Those elected to the class of Elective Members were Fred H. Glenny, Philip S. Humphrey, Wesley E. Lanyon, Margaret H. Mitchell, Thomas L. Quay, and Dale A. Zimmerman. William Homan Thorpe (Great Britain) was elected as an Honorary Fellow. New Corresponding Fellows are D. S. Rabor (Philippines), Franz Sauer (Germany), Ernst Sutter (Switzerland), and Gunnar Svärdson (Sweden). The Brewster Memorial Award was given to A. W. Schorger for his book "The Passenger Pigeon." The Union's next annual meeting will be held at the Saskatchewan Museum of Natural History, Regina, August 25-30, 1959.

A painting of the Turquoise-browed Motmot by Don R. Eckelberry is published as the frontispiece of this issue through the generosity of a donor who wishes to remain anonymous.

In the course of the past year, the number of countries outside of the United States to which the Condor is sent passed 50. It now stands at 58. The Society's business managers and editors thought the list might be of interest to members, and the names of the 58 countries follow:

Argentina	Japan
Australia	Jugoslavia
Austria	Kenya, B. E. A.
Belgian Congo	Luxembourg
Belgium	Malaya
British Somaliland	Mexico
Brazil	Natal, South Africa
Canada	Netherlands

Cape Province,	New Zealand
South Africa	Northern Rhodesia
Ceylon	Norway
Chile	Nyasaland
Colombia	Paraguay
Costa Rica	Peru
Czechoslovakia	Philippines
Denmark	Poland
Dominican Republic	Portugal
England	Scotland
Estonia	Spain
Finland	Surinam (Dutch Guiana)
Formosa	Sweden
France	Switzerland
Germany	Tanganyika, B. E. A.
Greece	Thailand
Guatemala	Transvaal, South Africa
Hungary	Turkey
Iceland	Uruguay
India	Venezuela
Israel	U. S. S. R.
Italy	

## PUBLICATIONS REVIEWED

**HAWKS, OWLS AND WILDLIFE.** By John J. Craighead and Frank C. Craighead. Stackpole Company, Harrisburgh, Pennsylvania, and Wildlife Management Institute, Washington, D.C., 443 pp., 1956. \$7.50.

This ambitious study of predation was carried out in a township (36 sq. mi.) in southern Michigan, and twelve square miles of semi-wilderness in northwestern Wyoming. The former area, judged to be typical of the region, was intensely farmed, woodlots remaining on only 11 per cent of it. The Wyoming area included wooded river bottoms, fields, sagebrush benches and forested buttes. The two areas were selected to determine whether predation operated in the same manner in civilized and wilderness localities.

For two years hawks and owls were intensively studied on the Michigan area and reliable estimates of the fall, winter, spring, and summer populations were made. During the breeding season all nests were located and frequent climbs were made to each to determine the food brought to the nestlings. Some nestlings were also tethered to obtain food data for the period after which they would normally have left the nest. During the autumn and winter extensive collections of pellets were analyzed. Studies in the Wyoming area were made only during one summer and were used primarily for comparison, but as no adequate study was made of the prey popula-

tions, the results are difficult to interpret and evaluate. The book contains a wealth of material on territory, movements, food, food requirements, clutch size, and breeding success of birds of prey in relation to the populations of the other raptor species present. In the opinion of the reviewer this constitutes the most important contribution of the book. However, many of the numerous tables which are used to present the data are located far from their text reference, and their number is excessive.

In Michigan an effort was made to estimate the populations of the chief prey species. Four square miles were closely observed and the relative abundance of *Microtus* in the areas of suitable habitat were noted. Populations were estimated by obtaining a trap-night index and then the areas were "trapped out" to determine the relationship between the index and the number of voles present. The estimate of the population on the four square miles was then extrapolated to cover the township. The extent to which this technique overcame the usual bias in estimation of *Microtus* populations by the use of traps remains to be investigated. No systematic trapping of *Peromyscus* was conducted. Instead, estimates were taken directly from the work of Burt in other areas in southern Michigan. Pheasant and Bobwhite numbers were determined by direct count. Cottontail population density was estimated from the number of animals jumped, tracks, and the distribution of good refuges. Fox squirrel density was estimated by a direct count in one woodlot and these figures were multiplied by the number of acres of suitable habitat. Small birds were estimated on the basis of birds seen per acre of suitable habitat in the winter, and upon estimates in the literature of breeding bird densities in similar agricultural areas for the spring and summer. The accuracy of some of these methods is questionable and, furthermore, insufficient attention was given to the magnitude of the seasonal and yearly fluctuations in the abundance of these species and the effects of this on the estimation of predation's role.

Most studies of predation have concerned themselves with the relationship between one predator and one of its important prey species. Among insects, where carnivores and herbivores are often highly specialized for the utilization of a restricted food source, this approach has been successful, and there are many well-known examples of natural control in the entomological literature. The vast majority of vertebrates, how-

ever, are much more catholic in their use of the environment, and the single-species approach has led to conclusions which are not really satisfactory to anyone. Indeed, many leaders in the field doubt that predation is important in determining population levels. Therefore, it is most welcome to find a study in which at least an attempt has been made to study the interactions of collective predator and prey populations. No one without the great enthusiasm of the Craigheads for the birds of prey would have attempted such an ambitious project nor would they have progressed as far. One can only wish that they had taken a more chewable bite, concentrating more of their efforts upon a study of the ecology of one of the chief prey species such as *Microtus*.

Unfortunately, the authors' zeal did not extend undiminished to the prey species and the impression given by the book is that the prey densities were "determined" in a small fraction of the over-all time devoted to the raptors. Great pains were taken to find every hawk and owl nest and, yet, figures for the density of such important prey species as *Peromyscus* and passerine birds were largely borrowed from other publications. Since a study of this type is no stronger than its weakest estimate, it would have been much more valuable to have tried to obtain a greater accuracy in the estimates of the most important prey species rather than striving for a relatively useless 100 per cent accuracy in raptor-population censuses. The general imprecision of prey population estimates and the lack of prey-vegetation studies make it difficult to evaluate the discussion of the role of predation which concludes the book.

It is regrettable that the authors have fallen prey to the tendency to assume the conclusions they wish to make. One finds statements of conclusion preceding their supporting evidence in the book. For example, the chapter on the function of predation precedes the chapter on predation's annual toll. Nonetheless, the authors have beautifully demonstrated how the pressure of a collective raptor population is distributed over the total prey population. They suggest that, since the prey populations in spring have already survived the winter, they cannot be considered surplus. Therefore, they believe that early spring predation significantly reduces the populations below the carrying capacity of the environment. This is certainly a tantalizing suggestion and should be pursued further. However, in the absence of knowledge of the amount of food available to the prey species it cannot be considered to

have been substantiated in this study. If one does not know the value of the carrying capacity he cannot know whether a population has been depressed below that value. Therefore, the information given in this book does not impinge upon the controversy over Errington's views in quite the manner the authors suppose, but in all fairness it must be admitted that Errington was not able to measure the food supply either, and he probably would not have arrived at his well-known conclusions if he had studied a situation such as that investigated by the Craigheads. It would appear that the answer to the question whether predation does depress vertebrate populations below the carrying capacity of the environment and, if so, how much so and how often, will not be provided by studies oriented primarily toward predators, with measurements of prey populations for the sole purpose of permitting the estimation of the percentage of the populations taken, but rather by studies oriented toward the relationships between the prey populations and their environmental resources, with predation considered in relation to this. In only such a manner would it seem possible to be able to determine the role of predation in terms of the total ecology of any species.

This book should be read and studied carefully not only by persons interested in the general biology of the birds of prey, but also by anyone interested in predation. The critical nature of this review should not be taken to mean that the book is of little value. In spite of its shortcomings, the study is one of the best available for vertebrate populations and, even more significantly, it demonstrates the possibility of dealing effectively with the pressure of collective predator populations upon all the important prey species. It therefore points the way toward the study of predation as a part of the over-all functioning of the ecological community.—GORDON H. ORIAN.

#### COOPER SOCIETY MEETINGS

##### SOUTHERN DIVISION

**MAY.**—The regular monthly meeting of the Southern Division of the Cooper Ornithological Society was held May 27, 1958, at the Los Angeles County Museum, with Thomas R. Howell, president, presiding.

The following names were proposed for membership: Lt. Cmdr. William G. Lehmann (DC), U.S.N., U.S. Naval Hospital, Oakland, Calif., by John Davis; Miss Kay Binder, 3838 West 61st St.,

Chicago 29, Ill., John Bursewicz, 14 Chapin St., Jamestown, N. Y., Kirk E. Downing, Box 489, Arkansas City, Kans.; Lewyn Edward Geiger, P. O. Box 146, Wellborn, Fla., Winthrop W. Harrington, Jr., 1900 Massachusetts Ave., Lexington 73, Mass., John Henderson Hart, 2700 Verona Rd., Kansas City, Mo., Miss Phyllis Lorraine Hurlock, R.D. 1, Coatesville, Pa., Peter M. Isleib, Jones Hollow Rd., Marlborough, Conn., Miss Hazel Belle Philbrick, 5090 Washington, St. Louis 8, Mo., Bryan Leonard Sage, 11 Deepdene, Potters Bar, Middlesex, England, Allen W. Stokes, Dept. of Wildlife Management, Utah State University, Logan, Utah, Farris S. Swackhamer, Shell Chemical Corp., P. O. Box 335, 1120 Commerce Ave., Union, N.J., Miss Katrina Thompson, 2029 Milford, Houston 6, Tex., Dr. Clifford Tillman, 492 Cherokee Park, Natchez, Miss., Maynard J. Toll, 414 S. Irving Blvd., Los Angeles 5, Calif., Miss Virginia M. Vaden, 4325 Bowser Ave., Dallas 19, Tex., Henry M. Weber, M.D., 82259 Miles, Indio, Calif., Lovett Edward Williams, Jr., Wildlife Research Unit, A.P.I., Auburn, Ala., and Robert J. Williams, Botany Dept., University of Wisconsin, Madison, Wis., all by C. V. Duff; Roger W. Jessup, 5431 West San Fernando Rd., Glendale, Calif., by Ed N. Harrison; Dale Warren Rice, U.S. Fish & Wildlife Service, % Navy 3080, Box 1, FPO San Francisco, Calif., by Johnson A. Neff; Stephen C. Bromley, 9359 Gotham St., Downey, Calif., and James R. Northern, Los Angeles County Museum, Exposition Park, Los Angeles 7, Calif., both by Kenneth E. Stager; Oscar M. Root, Brooks School, North Andover, Mass., by Wendell Taber; Herold Connon, 288 Lester Ave., Oakland 6, Calif., Mrs. Mildred V. Davies, 1019 W. 23rd St., Upland, Calif., William Harding, 526 S. Van Ness, Santa Ana, Calif., and Neal G. Smith, 1751 E. 29th St., Brooklyn 27, N.Y., all by Jack C. von Bloeker, Jr.; Julius J. Keil, 3347 14th St., Long Island City 6, N.Y., and Jorge A. Ibarra, Museo Nac. de Historia Natural, Salon No. 2 La Aurora, Guatemala City, Guatemala, both by C. V. Duff.

Mr. John Wintersteen of the Department of Zoology, U.C.L.A., showed his excellent colored motion picture, "East African Safari."—DOROTHY E. GRONER, *Secretary*.

**SEPTEMBER.**—The regular monthly meeting of the Southern Division was held September 20, 1958, at the Los Angeles County Museum, with Thomas R. Howell, president, presiding.

The following names were proposed for membership: Edward M. Chappell, P. O. Box 1085,

Escondido, Calif., Joseph R. Jehl, Jr., 385 Grove St., Clifton, N.J., Mrs. T. S. Kimball, 1250 N. Everett St., Glendale 7, Calif., Harvey C. Kirk, 1605 So. 5th St., Alhambra, Calif., Fant W. Martin, 1078 Crescent Dr., Logan, Utah, Bertram George Murray, Jr., 807 Mountain Ave., Bound Brook, N.J., Art Schaffner, 170 Laurel St., Buffalo 8, N.Y., John Kenneth Taylor, 128 Charles St., New York 14, N.Y., Mrs. Jephtha H. Wade, 251 Old Billerica Rd., Bedford, Mass., and Peter W. Westcott, Linden Lane, Chatham, N.J., all by C. V. Duff; Dr. Roderich Thun, Falkstrasse 16, Innsbruck, Austria, by Don R. Eckelberry; Roger W. Jessup, 5431 W. San Fernando Rd., Glendale, Calif., Anthony Thormin, 672 So. La Fayette Park Pl., Los Angeles 57, Calif., and James K. Vardaman III, 133 So. Lucerne Blvd., Los Angeles 4, Calif., by Ed N. Harrison; Nicholas E. Collias, Dept. of Zoology, University of California, Los Angeles 24, Calif., and Dr. Malcolm Stephen Gordon, Dept. of Zoology, University of California, Los Angeles 24, Calif., both by Thomas R. Howell; David L. Patrick, Rt. 5, Box 241, Tucson, Ariz., by Joe Marshall; Wm. I. Harrison, 1525 Sixth Ave., Grinnell, Iowa, by Frank A. Pitelka; William R. Goodge, Dept. of Gross & Neurological Anatomy, West Virginia University Medical School, Morgantown, W. Va., by Frank Richardson; Charles William Erickson, 16258 Runnymede, Van Nuys, Calif., by Kenneth E. Stager; Mrs. Dorothy E. Hunt, 4111 Trout Gulch Rd., Aptos, Calif., by Leland Stallcup; Lester R. Badger, Rt. 1, Excelsior, Minn., Lawrence R. Smith, 6121 Bellingham Ave., No. Hollywood, Calif., and Terry A. Vaughan, Museum of Natural History, University of Kansas, Lawrence, Kans., by J. C. von Bloeker, Jr.

Arnold Small gave the following recent observations: September 1, waters south and east of San Clemente Island, 24 Black-footed Albatross, 1 Pale-footed Shearwater, 375 Pink-footed Shearwater, 40 Sooty Shearwater, 75 Leach Petrel, 1200 Black Petrel, 20 Ashy Petrel, 40 plus Least Petrel, 1 Long-tailed Jaeger, 4 Pomarine Jaeger, 1 Parasitic Jaeger, 30 Sabine Gull, 40 Arctic Tern; September 6, near Oxnard, 1 Solitary Sandpiper, 26 White-tailed Kite; September 13, 30 miles west of Point Loma, 2 Manx Shearwater, 6 Least Petrel.

Dr. Nicholas E. Collias of the Zoology Department, U.C.L.A., presented a talk on "Behaviour of the Black-headed Weaver-bird of Africa."—DOROTHY E. GRONER, *Secretary*.

OCTOBER.—The monthly meeting of the Southern Division was held October 28, 1958, in the Life Sciences Building, U.C.L.A., with Thomas R. Howell presiding. The following names were proposed for membership: Warren Rook, % William Tell Motel, 2509 Santa Monica Blvd., Santa Monica, Calif., and Kirby Wolfe, 267 Marquita Ave., San Clemente, Calif., both by Don Bleitz; John J. McCoy, 8618 Emerald Isle Cir. S, Jacksonville 11, Fla., by Pierce Brodkorb; Fred Waters Bone, 603 Yale Ave., Riverview Hts., New Brunswick, Canada, J. W. O'Neill, 9 Wyngaarde Ave., Piedmont 11, Calif., and Paul Slud, Museum of Zoology, University of Michigan, Ann Arbor, Mich., all by C. V. Duff; Einar Helmersen Bengt, Box 105, Pixbo, Sweden, and George Puvalic, 52-A Veterans Administration Hospital, Sepulveda, Calif., both by Frank A. Pitelka; Theodore A. Rehm, P.O. Box 367, Scottsdale, Ariz., and Theodore Tice, 3924 Rosemead Blvd., Pico Rivera, Calif., both by Jack von Bloeker, Jr.

The meeting then adjourned for members to attend a lecture by Dr. W. H. Thorpe of the Department of Zoology, Cambridge University, and President, British Ornithologists' Union. Dr. Thorpe's lecture, "The Study of Song," was given under the auspices of the Lida Scott Brown Foundation, U. C. L. A.—DOROTHY E. GRONER, *Secretary*.

#### NORTHERN DIVISION

NOVEMBER.—The monthly meeting of the Cooper Ornithological Society, Northern Division, was held on Thursday, November 6, 1958, on the Berkeley campus of the University of California. Dr. John Davis presided. The following names were proposed for membership: Mr. M. Konishi, International House, Berkeley, by Frank A. Pitelka, and Mr. Joseph M. Delvin, Philadelphia, Pa., by Don R. Eckelberry.

President Davis reported briefly on the 75th Anniversary meeting of the American Ornithologists' Union which was held in New York City during mid-October.

Among field observations reported, Mrs. Junea W. Kelly remarked upon a great invasion of Golden-crowned Kinglets at Ross and Golden Gate Park. Dr. Davis also commented upon an influx of kinglets at the Hastings Natural History Reservation in recent days.

Guest speaker for the evening was Mrs. Junea W. Kelly, who gave a vivid account of her experiences and impressions at the Twelfth International Ornithological Congress, Helsinki, Finland, in June of 1958.—ROBERT I. BOWMAN, *Secretary*.

**For Sale, Exchange, and Want Column**—Each member of the Cooper Society is entitled to one short advertising notice in any issue of the Condor free. Notices of over 3 lines will be charged for at the rate of 25 cents per line. Send advertising copy to Jack C. von Bloeker, Jr., Los Angeles City College, 855 N. Vermont Ave., Los Angeles 29, California.

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**WANTED**—Life Histories of North American Birds of Prey, Part I, by Bent, U.S. National Museum Bull. No. 167, May 3, 1937. Please state price and condition.—MRS. JOHN Q. BURCH, 4206 Hall-dale Ave., Los Angeles 62, Calif.

**FOR SALE**—Bent's Life Histories of N. A. Birds, USNM Bulls. 176, 195, 196; The Condor, 1911 to 1929, inclusive; A.O.U. Check-list, 3rd Edition.—JAMES B. DIXON, 2266 Cranston Dr., Escondido, Calif.

**FOR SALE**—Dawson, Birds of California, Student Edition, 4 vols., excellent condition, \$50.00; Roberts, The Birds of Minnesota, 2 vols., like new, \$20.00; Brandt, Arizona and Its Bird Life, like new, at pre-publication price, \$12.00.—DOROTHY E. GRONER, 4038½ Garden Ave., Los Angeles 39, Calif.

**FOR SALE**—Friedmann, The Honey-Guides, \$1.75; N. A. Fauna No. 55, \$6.00; Goldman, Biological Investigations in Mexico, \$4.50; Miller & Kellogg, List of N. A. Recent Mammals, \$3.50; Proc. First N. A. Wildlife Conf., \$2.00; add postage.—VICTOR H. CAHALANE, State Museum, Albany 1, N. Y.

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